DMP·60 SERIES PLOTTERS
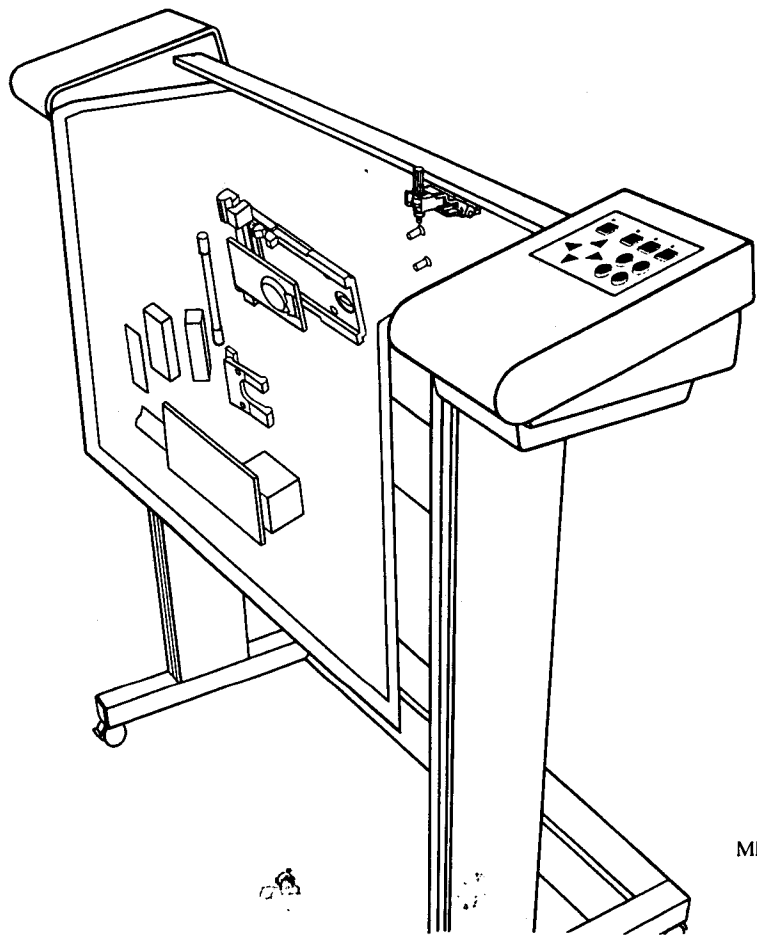
OPERATION MANUAL

DMP-60 SERIES PLOTTERS
OPERATION MANUAL

HOUSTON INSTRUMENT™
A Summagraphics Company

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. CAUTION! Changes or modifications, not expressly approved by Houston Instrument who is responsible for FCC compliance, could void the users authority to operate this equipment.

NOTICE

This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

WARRANTY

The warranty terms and conditions for this Houston Instrument product are listed on the Warranty Card, which is included with your purchase.

OSHA CHEMICAL HAZARD COMMUNICATION STANDARD

Finished products manufactured and sold by Houston Instrument are not hazardous under the criteria identified per 29 CFR 1910.1200 (g) (2).

The writing pens used with this plotter are encapsulated in plastic and are considered an "article" under OSHA Chemical Hazard Communication "Employee Right To Know" standard 1910.1200 (b) (5) (iv).

DISCLAIMER OF USE

Houston Instrument DMP-60 series plotters produce high-quality plots when used in accordance to the instruction manual. These plotters are not intended for any other use.

There are no customer serviceable parts in this instrument. All repairs are to be made by authorized Houston Instrument service personnel.

TRADEMARK ACKNOWLEDGEMENTS

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AutoCAD is a trademark of Autodesk, Inc.

BASIC is a trademark of the trustees of Dartmouth College.

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IBM PC, IBM AT, IBM PC/XT and IBM PS/2 are trademarks of International Business Machines Corporation.

MS-DOS is a trademark of Microsoft Corporation.

Macintosh, Macintosh Plus, Macintosh SE, and Macintosh II are trademarks of Apple Computer Company.

VersaCAD is a registered trademark of VersaCAD Corporation.

IMPORTANT SAFETY INSTRUCTIONS

1.   Read all of these instructions.

2.   Save these instructions for later use.

3.   Follow all warnings and instructions marked on the plotter.

4.   Unplug this unit from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

5.   Do not use the plotter near or in water.

6.   Do not place the plotter on an unstable cart, stand, or table. The unit may fall, causing serious damage.

7.   Slots or openings in the cabinet and the back or bottom are provided for ventilation; to ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the unit on a bed, sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

8.   The plotter should be operated from the type of power source indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.

9.   The plotter is equipped with a three-wire grounding type plug, which is a plug having a third (grounding) pin. This plug will fit only into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding-type plug.

10.   Do not allow anything to rest on the power cord. Do not locate the plotter where persons will walk on the cord.

11. If an extension cord is used with the plotter, make sure that the total of the ampere ratings on the products plugged into the extension cord does not exceed the extension cord ampere rating. Also, make sure that the total of all products plugged into the wall outlet does not exceed 15 amperes.

12. Never push objects of any kind into the plotter through cabinet slots since they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the plotter.

13. Do not attempt to service the plotter yourself. Opening or removing those covers marked "Do Not Remove" may expose you to dangerous voltage points or other risks. Refer all servicing in those compartments to service personnel.

14. Unplug the plotter from the wall outlet and refer servicing to qualified personnel under the following conditions:

    A. When the power cord or plug is damaged or frayed.

    B. If liquid has been spilled into the plotter.

    C. If the plotter has been exposed to rain or water.

    D. If the plotter does not operate normally when operating instructions are followed. Adjust only those controls that are covered by the operating instructions since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore this product to normal operation.

    E. If the plotter has been dropped or the cabinet has been damaged.

    F. If the plotter exhibits a distinct change in performance, indicating a need for service.

MANUAL REVISION HISTORY

DATE   **NOTES**

SEP 87   Original issue.

JAN 88   Revised Paragraphs 2.4.7, 2.5.5, A.6.2.
Revised Table 1-1.
Revised BASIC Programs, Appendix E.

SEP 88   Added Section 0.

NOV 88   General update to incorporate *DMP-60 Series Plotters MW-1192/MW-1193 ROM Set Supplement*, part number MI-1138.

JUN 89   Replaced warranty information with warranty reference.
Updated Table 1-6.

JUN 90   Replaced all Customer Confidence Test plots. Replaced all references to Ametek with Summagraphics, new division owner.

QUICK START

0.1   INTRODUCTION

Congratulations on your purchase of a Houston Instrument™ DMP-60 series plotter. We know that you will find this to be a useful graphics tool and that you will receive many years of service from it.

We also realize that most of us like to put our new computer accessories to work as soon as possible. The DMP-60 series plotters have been carefully designed for both easy installation and easy use. That's what these instructions are all about. In most cases, you can use the following directions and have the plotter operating with your computer and plotting software very quickly. Although specific AutoCAD™ and VersaCAD® setup information is provided in this section, the concepts can be applied to any software package being used with the plotter.

Please keep in mind that these directions are simply intended as a quick way to help you use your new plotter. If you have any difficulty, the directions will refer you to other parts of this manual. In any case, be sure to read the entire manual after installation so that you can learn about all of the capabilities and features of your new plotter.

0.2   WHAT YOU WILL DO

Using this Quick Start Section, you will learn how to:

- Assemble and install the plotter,

- Set the chart size and load a chart,

- Install a pen,

- Verify plotter operation,

- Use the plotter menu to configure the plotter,

- Set up the plotter for use with either AutoCAD or VersaCAD,

- See where to get help in case of hardware or software problems.

0.3   ASSEMBLY AND INSTALLATION

☐   Unpack the plotter and accessories from the shipping box.

☐   Look at the power entry module on the bottom of the plotter. Your plotter may be equipped with either of two power entry modules. One module uses a pin to indicate the plotter's voltage setting (see Figure 0-1). The other module uses a numbered voltage select board inside the fuse cavity (see Figure 0-1). Be sure the number visible matches the line voltage at your site. If not, refer to Paragraph 5.2.

☐   Assemble the plotter stand and attach the plotter to the stand using the instructions packed with the stand.

CAUTION

Do not operate the plotter until after you have assembled the floor stand and attached the plotter to it. Otherwise, damage to the plotter or the plotting materials can result.
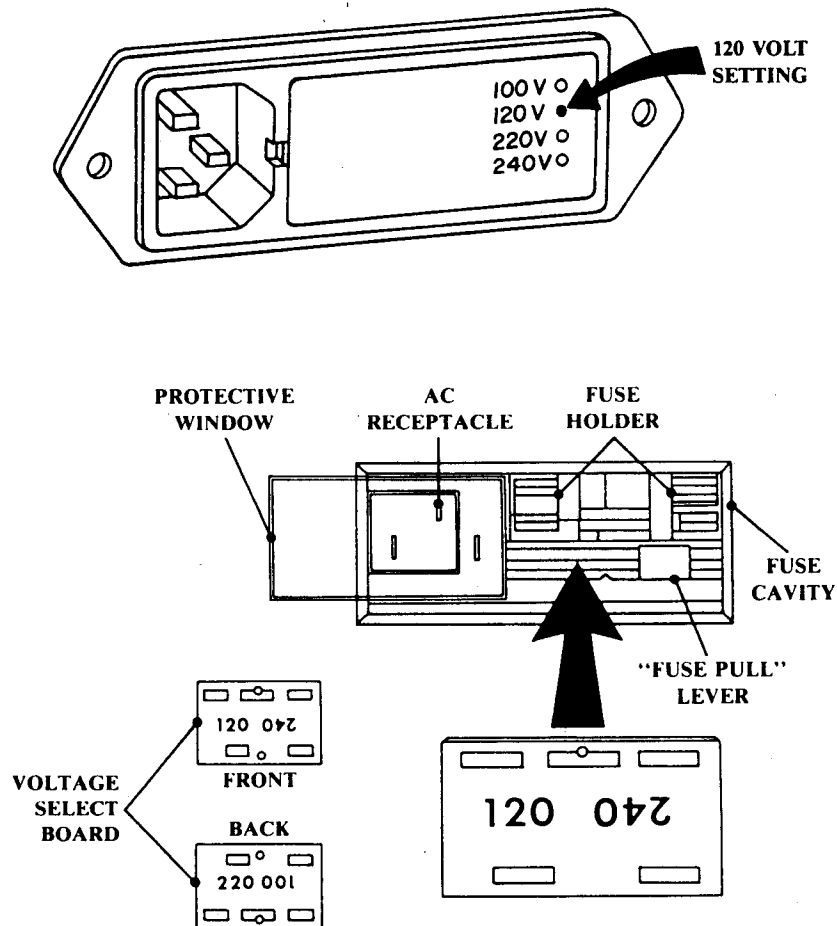

FIGURE 0-1. EXAMPLE 120 VOLT SETTING

☐   Connect the power cord to the plotter and power source.

☐   Find the power switch on the' front of the plotter and set it to ON to power on the plotter. (After the plotter initializes, the RESET and LOAD LEDs will blink on and off.)

0.4   CHART SIZE SETTING

☐   Raise the left pinch roller arm. See Figure 0-2.

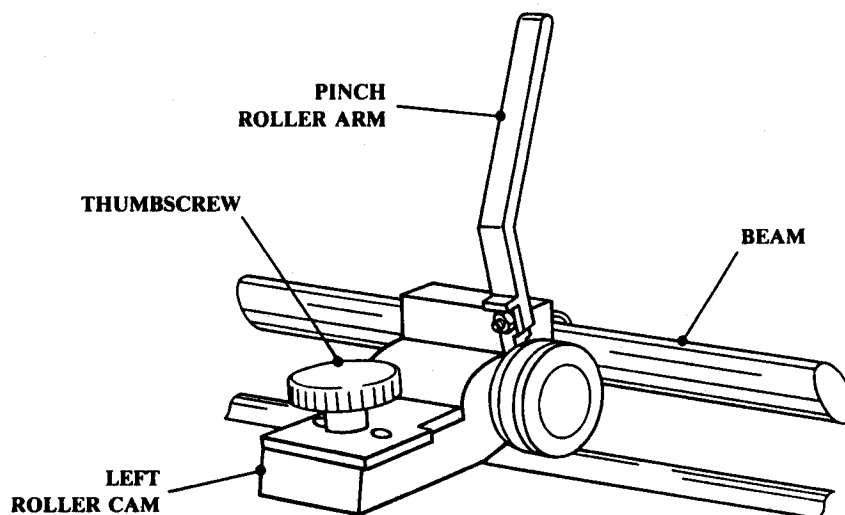**FIGURE 0-2. LEFT PINCH ROLLER ASSEMBLY AND THUMBSCREW**

☐   Loosen the thumbscrew on the left pinch roller.

☐   Slide the left pinch roller to the threaded hole position on the platen that matches your chart size, then tighten the left pinch roller thumbscrew. See Figure 0-3.
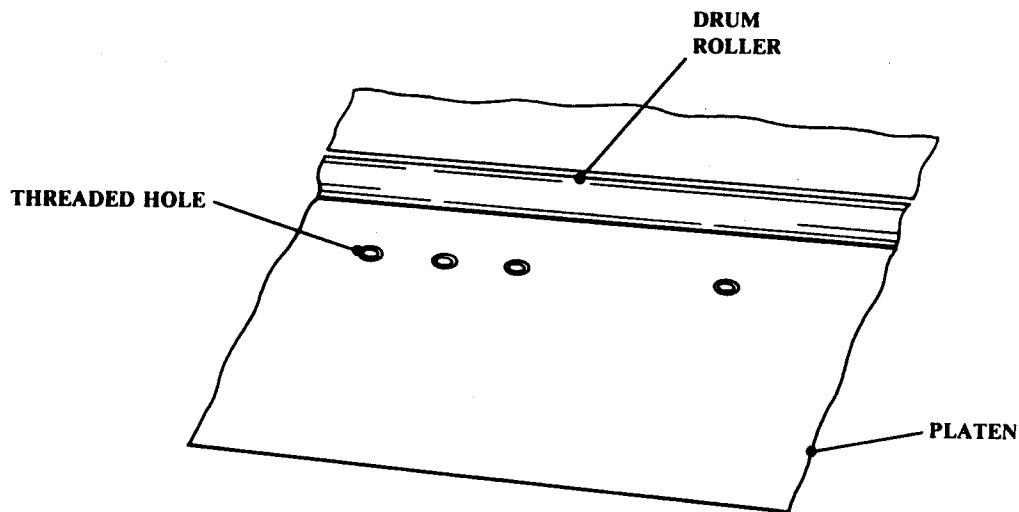

FIGURE 0-3. THREADED HOLES ON PLATEN

If you had any difficulty with chart size setting, refer to Paragraph 1.7.

0.5 CHART LOADING

☐ Raise the right pinch roller arm.

☐ Slide the chart under the pinch rollers so that its right edge aligns with the inside of the white line on the right side of the plotter and the front edge of the chart aligns with the groove on the front of the plotter. Then close both pinch roller arms. See Figures 0-4 and 0-5.
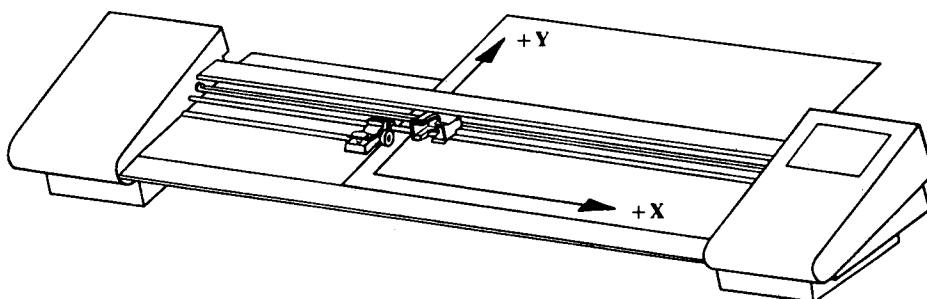
This example shows size C media loaded (left pinch roller assembly in position 5 and the pen holder at left plot origin).

Align the edge of the chart with the groove on the platen and the white line on the right side of the platen.

FIGURE 0-4. LOADING SMALL CHARTS
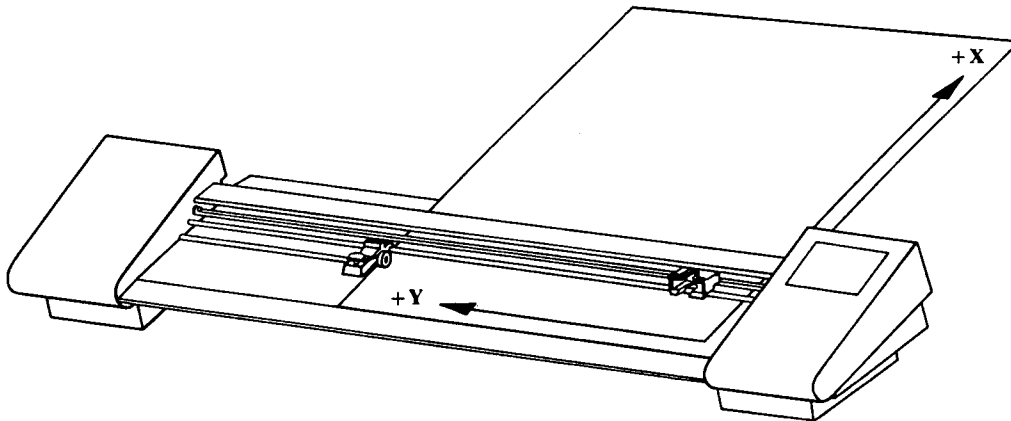
This example shows size D media loaded (left pinch roller assembly in position 5 and the pen holder at right plot origin).

Align the edge of the chart with the groove on the platen and the white line on the right side of the platen.

FIGURE 0-5. LOADING LARGE CHARTS

☐   Press the control panel LOAD switch to load the chart.

If you had any difficulty with chart loading, refer to Paragraph 1.7.

0.6   **PEN INSTALLATION**

☐   Prepare the disposable technical drafting pens using the instructions packed with the pens.

☐   Install the pen in the plotter pen holder.

Refer to Paragraph 1.8 for more information if you had any trouble with the pen.

0.7   **DATA CABLE CONNECTION**

☐   If you have purchased a data cable, connect it to the data connector on the back of the plotter and to the host computer. Refer to Figure 1-1 to identify the data connector.

☐   If you are making your own data cable, then refer to your plotting application software manual for any particular cabling requirements. Also, refer to Paragraph 1.9 and Appendix E for more information. If your computer is not listed in Appendix E, refer to the software package's cabling requirements for your particular computer.

0.8   **OPERATIONAL CHECK**

☐   Press the control panel LOCAL key once to place the plotter in local mode.

☐   Simultaneously press the control panel ▼ and ▲ keys to start the customer confidence test plot. Refer to Figure 0-6.

☐   Successful completion indicates that the plotter is operational.

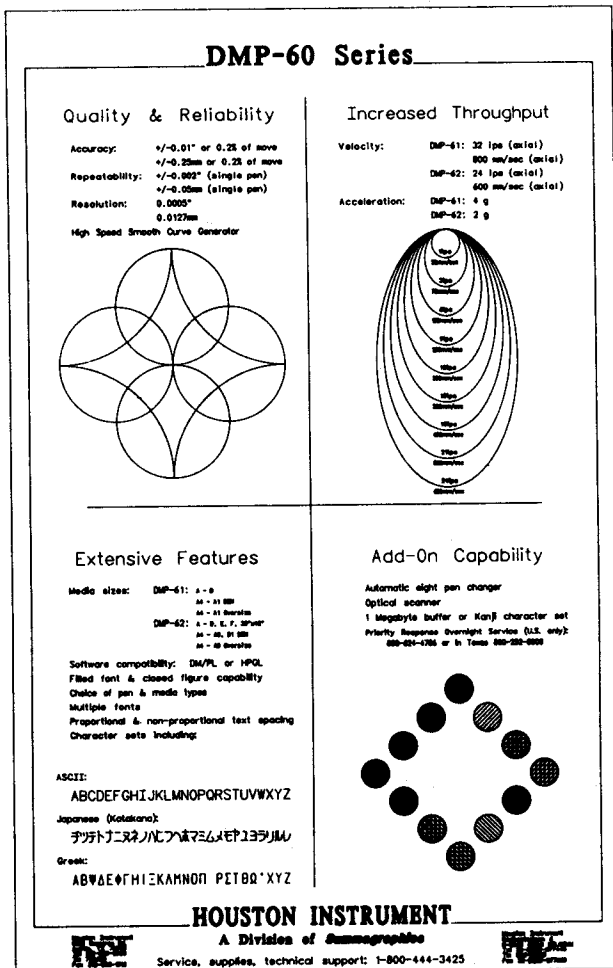☐   Open the left and right pinch roller arms and remove the chart.

FIGURE 0-6. CUSTOMER CONFIDENCE TEST PLOT

0.9   USING MENU MODE

The following exercise shows you how to use the plotter's menu mode to minimally configure the plotter and select the active plotting language. The plotter can operate with either DM/PL™ or HPGL as the active plotting language. DM/PL or HPGL is selected by entering and exiting the respective menu. The active plotter language (DM/PL or HPGL) is the one whose menu was most recently used.

It is important to note that the plotting language active in the plotter **MUST** match that of the plotting software you are using. That is, you must enable the desired plotting language in the plotter and select the appropriate plotter type with your plotting software. To use DM/PL, for example, select DM/PL as the active plotting language in the plotter, then select a Houston Instrument DMP-60 (or DMP-50) plotter as the plotting device in your software. To use HPGL, select HPGL as the active plotting language in the plotter, then select an HP™ 758X plotter as the plotting device in your software.

NOTE

The DM/PL and HPGL menus have several identical parameters. However, these menus are independent and are separately maintained in the plotter. This means that changing a parameter in one menu **DOES NOT** change any corresponding parameter in the other menu. This is a feature to allow you to maintain separate configurations for DM/PL or HPGL use. For example, if you change the DM/PL menu *BAUD RATE* parameter, the *BAUD RATE* parameter in the HPGL menu is **NOT** changed.

☐   Place a B-size (DIN A3) chart (or larger) under the pinch rollers so that the front of the chart is aligned with the groove on the front of the plotter and the right edge of the chart is aligned with the inside of the white line on the right side of the plotter, then close both pinch roller arms.

☐   Press the control panel LOAD key to load the chart.

☐   If you wish to configure the plotter for DM/PL operation, then go to Paragraph 0.9.1 and perform the steps listed. To configure the plotter for HPGL operation, go to Paragraph 0.9.2 and perform those steps. If you perform both configurations, do **LAST** the one that you wish to be active. Remember, the active plotter language (DM/PL or HPGL) is the one whose menu was most recently used.

         AFTER the plotter has been configured for both DM/PL and HPGL, you can easily change the active plotting language. First, load a B-size (DIN A3) or larger chart. To activate DM/PL, press the ENTER key, press the SCALE UR key, then press the SCALE UR key after the option select line is plotted. To activate HPGL, press the ENTER key, press the CLIP UR key, then press the CLIP UR key after the option select line is plotted.

0.9.1   Configuring DM/PL

☐   Press the control panel ENTER key and then the SCALE UR key to activate DM/PL Menu Mode. The plotter then plots the DM/PL option select line. When the plotter parks the pen over *help,* press the ENTER key to plot the help listing. Using the control panel ◄ and ► keys, move the pen over *list* in the option select line, then press the ENTER key to list the presently selected (underlined) menu options.

☐   Using the control panel ◄ and ► keys, move the pen over the *15* in the option select line; then press the ENTER key. The pen then moves to the presently selected baud rate. Using the ◄ and ► keys, move the pen over the baud rate that matches your plotting software baud rate requirement and press the ENTER key.

☐   Using the control panel ◄ and ► keys, move the pen over the *16* in the option select line and then press the ENTER key. The pen then moves to the presently selected parity setting. Using the ◄ and ► keys, move the pen over the parity setting that matches your plotting software parity requirement and press the ENTER key.

☐   Using the control panel ◄ and ► keys, move the pen over the *17* in the option select line; then press the ENTER key. The pen then moves to the presently selected RTS/DTR handshake mode. Using the ◄ and ► keys, move the pen over the handshake mode that matches your plotting software requirement and press the ENTER key. In general, select *TOGGLE* for hardware handshaking or *ALWAYS HIGH* for software handshaking.

☐   Press the control panel SCALE UR key or CLIP UR key to exit DM/PL menu mode. DM/PL is now the active plotting language.

☐   Open the left and right pinch roller arms. Remove and save the plotted menu.

☐   If configuring the plotter for HPGL also, then go to Paragraph 0.9.2. If not, then go to Paragraph 0.10.

0.9.2   Configuring HPGL

☐   Press the control panel ENTER key and then the CLIP UR key to activate HPGL menu mode. The plotter then plots the HPGL option select line. When the plotter parks the pen over *help,* press the ENTER key to plot the help listing. Using the control panel ◄ and ► keys, move the pen over *list* in the option select line, then press the ENTER key to list the presently selected (underlined) menu options.

☐   Using the control panel ◄ and ► keys, move the pen over the *15* in the option select line; then press the ENTER key. The pen then moves to the presently selected baud rate. Using the ◄ and ► keys, move the pen over the baud rate that matches your plotting software baud rate requirement and press the ENTER key.

☐   Using the control panel ◄ and ► keys, move the pen over the *16* in the option select line and then press the ENTER key. The pen then moves to the presently selected parity setting. Using the ◄ and ► keys, move the pen over the parity setting that matches your plotting software parity requirement and press the ENTER key.

☐   Using the control panel ◄ and ► keys, move the pen over the *17* in the option select line; then press the ENTER key. The pen then moves to the presently selected RTS/DTR handshake mode. Using the ◄ and ► keys, move the pen over the handshake mode that matches your plotting software requirement and press the ENTER key. In general, select *TOGGLE* for hardware handshaking or *ALWAYS HIGH* for software handshaking.

☐   Using the control panel ◄ and ► keys, move the pen over the *18* in the option select line, then press the ENTER key. The pen then moves to the presently selected line status. Using the ◄ and ► keys, move the pen over the line status that matches your plotting software requirement and press the ENTER key.

☐   Press the control panel CLIP UR key or SCALE UR key to exit HPGL menu mode. HPGL is now the active plotting language.

☐   Open the left and right pinch roller arms. Remove and save the plotted menu.

☐   If configuring the plotter for DM/PL also, then go to Paragraph 0.9.1. If not, then go to Paragraph 0.10.

0.10   AUTOCAD AND VERSACAD SETUP INSTRUCTIONS

The previous paragraphs provided you with general setup instructions for your plotter.
The following paragraphs provide you with specific instructions to set up the plotter
for use with AutoCAD or VersaCAD (MS-DOS™ versions) software packages.

☐   Enter the plotter's DM/PL menu as explained in Paragraph 0.9.1 and select
the parameters listed below.

AutoCAD:

UART Parity	set to *EVEN*
Handshake RTS/DTR	set to *ALWAYS HIGH**
Baud Rate	leave at *9600*

* Set this parameter to *TOGGLE* if plotting from other than AutoCAD's main menu.

VersaCAD:

UART Parity	leave at *BIT8=0*
Handshake RTS/DTR	leave at *TOGGLE*
Baud Rate	leave at *9600*

NOTE
The plotter's factory menu settings will work with many software
packages; however, be sure to read your software manual to determine
any software specific setup requirements.

☐   Configure the serial port as explained below.

AutoCAD:

Choose "Configure AutoCAD" from the main software menu. Select the serial port
(COM1 or COM2) to which the plotter is connected.

VersaCAD:

Choose "Enviro" in the main software menu. Select the serial port (COM1 or COM2)
to which the plotter is connected.

☐   Select either the DMP-61 driver or the DMP-62 driver for your specific plotter model.

☐   The following paragraphs provide operating considerations when using AutoCAD or VersaCAD.

Clipping:

Clipping occurs when the drawing size is too large to fit on the available plot area. The plot area is typically less than the media size since the mechanism that holds the media prevents the plotter from drawing on that area. The available plot areas for each media size are listed in Paragraph 1.7. Note that if you plot to scale and the scale you choose does not fit within the available plot area, the plot will be clipped.

AutoCAD lists standard media sizes rather than plot areas. To avoid clipping, set the "User" selection to the exact plot area available for the media size that you are using and select plot to "Fit." This will prevent the plot from being clipped.

VersaCAD asks for the left border and the right border, and then queries the plotter and calculates the available plot area.

Pen Tip Width:

If the pen tip width value in AutoCAD is not set correctly, pen drag can occur. The values for the pens are:

0.35 mm pen tip width = 0.014 inch
0.50 mm pen tip width = 0.020 inch
0.70 mm pen tip width = 0.028 inch

The pen tip width in VersaCAD can be set in the "Enviro" section of the program.

Multi-colored Plots:

AutoCAD and VersaCAD must be told if the pen changer accessory is installed on the plotter. Otherwise, multi-colored plots will be drawn with a single pen. In AutoCAD, choose "Layer" and specify PEN NUMBER for the pen color. In VersaCAD, choose "Properties" and then choose "Pen."

> **NOTE**
> You can also initiate the plotter's confidence test to make sure the plotter is recognizing the pen changer (see Paragraph 2.3.2). If the confidence test is drawn with multiple pens, this indicates that the software setup is incorrect.

Stray Lines:

If your plot has stray or extraneous lines on it, follow the suggestions below.

- Run the plotter's confidence test to determine if the plotter has a mechanical problem (see Paragraph 2.3.2).

- Inspect the interface cable by removing the screws (usually two) from the connector ends and visually inspect the cable to determine if a wire has become disconnected. If you have the appropriate equipment, check the continuity of the cable.

- Check the *Handshake RTS/DTR* and *UART Parity* menu parameter selections to make sure they match your software requirements.

- Connect the plotter to another serial port on the computer, if available. If the plotter draws the plot successfully on a second serial port, the first serial port is probably malfunctioning.

0.11 DONE

If you had any trouble with menu mode, then refer to Paragraph 2.4 for more information.

This completes the installation, check out, and minimal configuration of the plotter. Be sure to read the remainder of the manual (these instructions are not intended as a substitute for the manual). Also, refer to your plotting application software manual if additional menu configuration of the plotter is needed. Typically, the most important configuration items are the data cable, baud rate, parity, and handshake mode (and line status for HPGL).

0.12 HOUSTON INSTRUMENT PRODUCT SUPPORT

Houston Instrument offers hardware and software support for all of its products. This help is only a telephone call away.

Please have the following information available when calling Houston Instrument:

- The product model number, which is printed on the bottom panel,

- The product serial number, which is printed on the bottom panel,

- The date of purchase,

- The type of maintenance agreement, if any,

- The reseller company name, contact name and phone number,

- A brief description of the question or problem.

After preparing the information requested above, you can contact Houston Instrument at 1-800-444-3425 for assistance. Your call will be received by the Call Center and routed to the Technical Support Hardware or Technical Support Software group depending on your question or problem type.

0.13   HOUSTON INSTRUMENT PRODUCTS

● Information about other Houston Instrument products is available from the Literature Department at 1-800-444-3425.

0.14   WARRANTY REGISTRATION

Remember to validate your **FREE** Priority Response Warranty by calling the HI Warranty Registration Department at 1-800-444-3425 for immediate registration.

THANK YOU FOR BUYING THIS HOUSTON INSTRUMENT PLOTTER!

SECTION 1
GENERAL INFORMATION

1.1   INTRODUCTION

The Houston Instrument DMP-61 and DMP-62 digital plotters are the perfect answers for multi-size media plotting applications. Besides having high speed, intelligence, and durability, the DMP-60 series plotters enable you to plot on a wide variety of standard English and metric size charts.

This manual uses the term *plotter* when it provides general information about both models. The specific model terms *DMP-61* or *DMP-62* are used if information pertains only to that particular model. This manual also uses the term *menu* when it provides general information about both the DM/PL and HPGL menu. The specific menu terms *DM/PL menu* or *HPGL menu* are used if information pertains only to that particular menu.

A few of the features you'll find on your plotter are:

●   DM/PL software protocol,

●   HPGL 758X emulation language which enables the DMP-61 to emulate the Hewlett-Packard™ model 7580B plotter and the DMP-62 to emulate the Hewlett-Packard model 7585B plotter,

●   Serial RS-232-C interface capabilities,

●   Membrane control panel switches,

●   English or metric scaling,

●   A wide variety of chart size selections,

●   0.001 inch, 0.005 inch, 0.1 mm, or 0.025 mm user-addressable resolution,

- A menu mode, which enables you to select the plotter's DM/PL and HPGL power-up configuration,

- An extensive customer confidence test capability,

- Window and scaling capabilities for manipulating the size, location, or appearance of a plot,

- Plotter report capabilities,

- Multiple sets of character styles and fonts which can be produced in many different sizes, rotated to any slope, and printed in italics,

- A wide variety of axial plotting speeds which can be selected in either English or metric measures. Each selected velocity can be regulated at all angles with the constant velocity feature.

This manual provides:

- Instructions on how to set up and manually operate the plotter in local mode,

- Specifications to help you interface your plotter with your computer system,

- Descriptions of your plotter's DM/PL and HPGL 758X emulation language software capabilities.

1.2   SPECIFICATIONS

The plotter's specifications are listed in Table 1-1.

TABLE 1-1. DMP-60 SERIES SPECIFICATIONS

ITEM	DESCRIPTION
Plotter	
DMP-61 Overall Height (including stand)	42 inches (1067 mm)
DMP-61 Width (including stand)	41 inches (1041 mm)
DMP-61 Depth (including stand)	21.75 inches (552.5 mm)
DMP-61 Weight (without stand)	30 pounds (13.6 kg)
DMP-61 Stand Weight	22 pounds (9.9 kg)
DMP-62 Overall Height (including stand)	51 inches (1295 mm)
DMP-62 Width (including stand)	52 inches (1321 mm)
DMP-62 Depth (including stand)	27.25 inches (692.2 mm)
DMP-62 Weight (without stand)	38 pounds (17.2 kg)
DMP-62 Stand Weight	30 pounds (13.6 kg)

TABLE 1-1. DMP-60 SERIES SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
Performance	
Accuracy	On single-matte polyester (3 mil) at 18° to 30° C, 0.2% of move or 0.010 inch (0.254 mm), whichever is greater
DMP-61 Pen Up/Down Plotting Speed	1 to 32 ips axial maximum (selectable)
DMP-62 Pen Up/Down Plotting Speed	1 to 24 ips axial maximum (selectable)
DMP-61 Pen Up/Down Acceleration	0.5 g, 1 g, 2 g, 3 g, or 4 g
DMP-62 Pen Up/Down Acceleration	0.5 g, 1 g, or 2 g
Addressable Resolution	0.001 inch, 0.005 inch, 0.1 mm, or 0.025 mm
Repeatability (Same Pen)	±0.002 inch (0.050 mm)

TABLE 1-1. DMP-60 SERIES SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
Plotting Materials	
Recommended Chart and Pen Type Combinations	H.I.-Frost and water-based hard nib or disposable stainless steel drafting pens
	Matte film and tungsten tip drafting pens and disposable drafting pens
	Vellum and disposable stainless steel, tungsten tip, or disposable drafting pens
DMP-61 Chart Sizes	Engineering A, B, C, and D
	Architectural A, B, C, and D
	DIN A4, A3, A2, and A1
	Oversize DIN A4, A3, A2, and A1
DMP-62 Chart Sizes	Engineering A, B, C, D, E, and F
	Architectural A, B, C, D, E, F, and architectural 30 × 42 inches
	DIN A4, A3, A2, A1, A0, and B1
	Oversize DIN A4, A3, A2, A1 and A0
Maximum Plot Areas	See Table 1-9

TABLE 1-1. DMP-60 SERIES SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
Interface	
Interface Capability	Asynchronous serial RS-232-C
Plotter I/O Connector	Rear panel RS-232-C DB-25P
Mating Connector	RS-232-C DB-25S
Transmit Data Format (From Plotter)	7 data bits, 1 parity bit (selectable), 2 or more stop bits
Receive Data Format (To Plotter)	7 data bits, 1 parity bit (selectable), 1 or more stop bits
Baud Rate	300, 600, 1200, 2400, 4800, or 9600
Buffer	16K (standard), 1M (optional)
Firmware	DM/PL and HPGL 758X emulation language

TABLE 1-1. DMP-60 SERIES SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
Environmental	
Operating Temperature	40° to 95° F (5° to 35° C)
Operating Relative Humidity	20% to 95% (non-condensing)
Storage Temperature	14° to 140° F (-10° to 60° C)
Storage Relative Humidity	5% to 95% (non-condensing)

NOMINAL LINE	MIN/MAX LINE	FUSE
100 Vac	89-108 Vac	1 Amp, Slo-Blo
120 Vac	108-130 Vac	1 Amp, Slo-Blo
220 Vac	197-238 Vac	0.5 Amp, Slo-Blo
240 Vac	216-260 Vac	0.5 Amp, Slo-Blo
48-62 Hz, single-phase, 85 VA max.		

1.2.1   Supplies

The DMP-60 series plotter is a precision instrument designed to produce professional high-quality output. Its performance and plot quality are determined by the pens, inks, and media that you choose to use.

A wide variety of plotter supplies are available on the market. Unfortunately, the quality of those supplies varies. Houston Instrument has extensively researched and tested its approved line of pens, inks, and media. Use of these supplies allows your plotter to operate at peak performance.

The following supplies and accessories are recommended for use on your plotter and are available from Houston Instrument or from your local distributor. For listings of recommended pen type and media combinations for your plotter, see Paragraphs 1.2 and 1.2.1.1, and *The Perfect Plot!* (part number MI-1098), which is supplied with your plotter.

TABLE 1-2. DMP-60 PLOTTER ACCESSORIES

MP-60 Multi-Pen Changer Accessory
SCAN-CAD™ Model 128A Scanner Accessory
One-Megabyte Extended Buffer Board
Kanji Character Set Board

TABLE 1-3. DMP-60 PLOTTER DOCUMENTATION

PART NUMBER	DESCRIPTION
MI-1110	DMP-60 Series Plotter Operation Manual†
MI-1044	DM/PL Command Language Manual‡
MI-1116	DMP-60 Series Plotter Service Manual‡

†Supplied with plotter purchase.
‡Optional.

TABLE 1-4. DMP-60 PLOTTING MEDIA

PART NUMBER	DESCRIPTION	QUANTITY
A Size/Engineering Media		
MC-3244	Vellum†	50 sheets
MC-3191	Vellum	50 sheets
MC-3230	H.I.-Vintage (Presentation Bond)	50 sheets
MC-3229	Clear Coated Film	10 sheets
MC-3098	Clear Film	100 sheets
B Size/Engineering Media		
MC-3245	Vellum†	50 sheets
MC-3192	Vellum	50 sheets
MC-3231	H.I.-Vintage (Presentation Bond)	50 sheets
MC-3195	Clear Film	50 sheets
C Size/Engineering Media		
MC-3222	H.I.-Frost Paper (Opaque Bond)	50 sheets
MC-3201	Matte Film	50 sheets
MC-3176	Vellum	50 sheets
C Size/Architectural Media		
MC-3204	Matte Film	50 sheets
D Size/Engineering Media		
MC-3221	H.I.-Frost Paper (Opaque Bond)	50 sheets
MC-3202	Matte Film	50 sheets
MC-3175	Vellum	50 sheets
MC-3269	Translucent Bond	150 sheets
D Size/Architectural Media		
MC-3220	H.I.-Frost Paper (Opaque Bond)	50 sheets
MC-3203	Matte Film	50 sheets
MC-3187	Vellum	50 sheets
MC-3270	Translucent Bond	150 sheets

†This vellum is approved for use with any type of H.I.-approved drafting pen and may be plotted on both sides.

TABLE 1-4. DMP-60 PLOTTING MEDIA (Continued)

PART NUMBER	DESCRIPTION	QUANTITY
E Size/Architectural Media		
MC-3242	Matte Film	25 sheets
MC-3241	Vellum	25 sheets
MC-3243	H.I.-Frost Paper (Opaque Bond)	50 sheets
30 × 42 inches Architectural Media		
MC-3256	Matte Film	25 sheets
MC-3254	Vellum	25 sheets
MC-3258	H.I.-Frost Paper (Opaque Bond)	50 sheets
707 mm × 1000 mm (B1) Media		
MC-3257	Matte Film	25 sheets
MC-3255	Vellum	25 sheets
MC-3259	H.I.-Frost Paper (Opaque Bond)	50 sheets

TABLE 1-5. PENS AND PEN ACCESSORIES

PART NUMBER	DESCRIPTION
Stainless Steel Drafting Pens (Disposable)	
MA-15	Adaptor for Disposable Drafting Pen
MP-729*	Red, fine point (0.35 mm)
MP-730*	Blue, fine point (0.35 mm)
MP-731*	Black, fine point (0.35 mm)
MP-732*	Green, fine point (0.35 mm)
MP-774*	Violet, fine point (0.35 mm)
MP-775*	Turquoise, fine point (0.35 mm)
MP-776*	Magenta, fine point (0.35 mm)
MP-737*	Red, broad point (0.70 mm)
MP-738*	Blue, broad point (0.70 mm)
MP-739*	Black, broad point (0.70 mm)
MP-740*	Green, broad point (0.70 mm)
MP-781*	Violet, broad point (0.70 mm)
MP-782*	Turquoise, broad point (0.70 mm)
MP-783*	Magenta, broad point (0.70 mm)

* Adaptor MA-15 not included

Stainless Steel Drafting Pen Kits (Disposable)	
PK-8097	Kit includes: one 0.35 mm black, one 0.35 mm red, one 0.35 mm blue, one 0.35 mm green, one MA-15 pen adaptor, and four caps
PK-8103	Kit includes: one each of black, red, blue, green, violet, turquoise, and magenta in fine and broad points; 14 each MA-15 adaptors; and 14 each caps

TABLE 1-5. PENS AND PEN ACCESSORIES (Continued)

PART NUMBER	DESCRIPTION
Tungsten Drafting Pens for Film and Vellum (Disposable)	
PK-8171	Kit includes: four 0.25 mm black, one MA-15 pen adaptor, and four caps
PK-8172	Kit includes: four 0.35 mm black, one MA-15 pen adaptor, and four caps
PK-8173	Kit includes: four 0.50 mm black, one MA-15 pen adaptor, and four caps
PK-8174	Kit includes: four 0.70 mm black, one MA-15 pen adaptor, and four caps
PK-8175	Kit includes: four 0.35 mm red, one MA-15 pen adaptor, and four caps
PK-8176	Kit includes: four 0.50 mm red, one MA-15 pen adaptor, and four caps
PK-8177	Kit includes: four 0.50 mm blue, one MA-15 pen adaptor, and four caps
PK-8178	Kit includes: four 0.70 mm green, one MA-15 pen adaptor, and four caps
Tungsten Tip Drafting Pens (Refillable)	
MP-602	Mounting adaptor and pen body without pen tip
MP-659	Tungsten drafting pen tip (0.35 mm)
MP-660	Tungsten drafting pen tip (0.50 mm)
MP-661	Tungsten drafting pen tip (0.70 mm)

TABLE 1-5. PENS AND PEN ACCESSORIES (Continued)

PART NUMBER	DESCRIPTION
Drafting Ink (One Ounce Bottles)	
MI-117	Blue (slow drying)
MI-118	Red (slow drying)
MI-119	Green (slow drying)
MI-121	Blue (fast drying)
MI-122	Red (fast drying)
MI-123	Green (fast drying)
MI-288	Black (all purpose)
Water-Based Hard Nib Pens	
MP-630	Red
MP-631	Blue
MP-632	Green
MP-633	Violet
MP-634	Brown
MP-635	Orange
MP-636	Black
MP-637	Lime Green
MP-638	Yellow
MP-639	Turquoise
Water-Based Hard Nib Pen Kits	
MP-640	Kit includes: one each of black, red, blue, green, violet, and orange
MP-641	Kit includes: one each of black, red, blue, green, violet, brown, lime green, and orange

TABLE 1-5. PENS AND PEN ACCESSORIES (Continued)

PART NUMBER	DESCRIPTION
Roller Ball Pens	
PK-8155	Kit includes: one each of black, red, blue, and green
PK-8156	Kit includes: one each of yellow, violet, turquoise, and magenta
PK-8159	Kit includes: four black
PK-8160	Kit includes: four red
PK-8161	Kit includes: four green
PK-8162	Kit includes: four blue
PK-8163	Kit includes: four yellow
PK-8164	Kit includes: four voilet
PK-8165	Kit includes: four turquoise
PK-8166	Kit includes: four magenta
PK-8168	Kit includes: four orange
PK-8169	Kit includes: four brown

1.2.1.1 Plotter Supply Compatibility

Houston Instrument offers a wide variety of pens and media for different types of plotting applications. Please note that not all pens may be used with all plotting materials. For best results, refer to the following chart and to *The Perfect Plot!* (part number MI-1098), which is supplied with your plotter, before ordering plotting supplies to see which plotting materials are recommended for use with any given pen type. A star (☆) in a chart column means that particular material may be used with a given pen type.

TABLE 1-6. PLOTTER SUPPLY COMPATIBILITY CHART

PLOTTING MATERIAL	PEN TIP TYPE			
	STAINLESS STEEL	REFILLABLE/ DISPOSABLE TUNGSTEN	HARD NIB (PLASTIC)	ROLLER BALL
Vellum	☆	☆		
Matte Film		☆		
Clear Coated Film			☆	
Translucent Bond	☆		☆	☆
H.I.-Frost	☆		☆	☆
H.I.-Vintage			☆	☆

1.3   FLOOR STAND ASSEMBLY

CAUTION
Do not operate the plotter until after you have assembled the floor
stand and attached the plotter to it. Otherwise, damage to the plotter
or the plotting materials can result.

The assembly instructions for the floor stand are included in the floor stand kit.
Complete the stand assembly and attach the plotter to it before proceeding with the
instructions in this manual.

1.4   REAR AND BOTTOM PANEL COMPONENTS

Read through the following descriptions of the rear and bottom panel controls and
components and familiarize yourself with the plotter. The location of each component
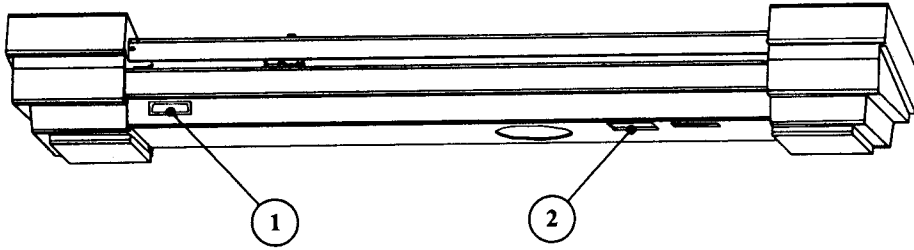is illustrated in Figure 1-1.

FIGURE 1-1. REAR AND BOTTOM VIEW OF PLOTTER

(1) RS-232-C PORT CONNECTOR. This DB-25P connector is the communication link between the plotter and a host computer. Interface instructions are listed in Paragraph 1.9.

(2) AC POWER ENTRY MODULE. The fuse, the voltage select board, and the receptacle for the ac power cord are located in the power entry module. Paragraph 1.6 explains how to power up the plotter. To convert the plotter's operating voltage, see Paragraph 5.2.

1.5 FRONT PANEL COMPONENTS

Read through the following descriptions of the front panel controls and components and familiarize yourself with the plotter. The location of each component is illustrated in Figure 1-2.
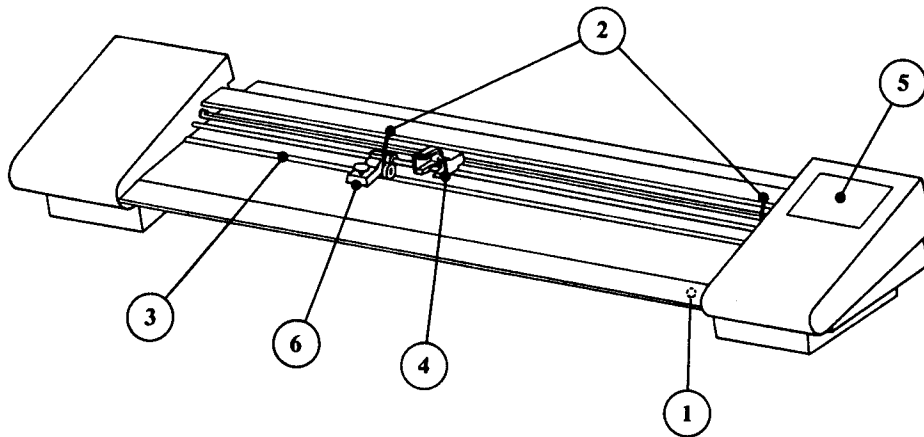
FIGURE 1-2. FRONT VIEW OF PLOTTER

(1)   POWER SWITCH. This rocker switch sets the plotter's power to on or off. When the power is on, the "1" indicator is visible on the switch. If the power is off, the "0" indicator is visible.

(2)   PINCH ROLLER LEVER ARMS. These two levers are used to raise and lower the pinch rollers from the chart drive shaft during media loading. (Media loading is discussed in Paragraph 1.7.)

(3)   CHART DRIVE SHAFT. When the plotter is operated in plot origin right (large chart format), this shaft drives the chart in the X direction. When the plotter is operated in plot origin left (small chart format), the shaft drives the chart in the Y direction. (Large and small chart formats are discussed in Paragraph 1.7.) The drive shaft moves the media only when the pinch rollers are lowered to the shaft.

(4)   PEN HOLDER. The pen holder is the mount for the plotter pen. The pen holder moves the pen in the Y direction when the plotter is operated in large chart format and in the X direction when the plotter is operated in the small chart format. Paragraph 1.8 explains how to install pens in the pen holder.

(5)   CONTROL PANEL. The control panel consists of 12 keys and four illuminating (on/off) LED indicators. All plotter activity must be initiated from the control panel functions. This includes initiating remote mode for computer control, local mode for manual operation of the pen and media, menu mode, and selecting window and scale box limit coordinates. Each control panel function is explained in Paragraph 2.1. The four LEDs indicate certain operating and error conditions, which are explained in Appendix A.

(6)   THUMBSCREW. When this thumbscrew is loosened, the left pinch roller assembly can be moved to a different chart size marker. When the thumbscrew is tightened, it secures the left pinch roller assembly to the platen. (Media loading is discussed in Paragraph 1.7.)

1.6   POWERING UP THE PLOTTER

NOTE

Safety Ground Installation: An insulated grounding conductor that is identical in size, insulation material, and thickness to the grounded and ungrounded branch-circuit supply conductors except that it is green with or without one or more yellow stripes should be installed as part of the branch circuit that supplies power to the wall outlet.

The grounding conductor described above is to be grounded to earth at the electrical service equipment, or if supplied by a separately derived system, the grounding conductor should be at the supply transformer motor-generator set.

The attachment plug receptacles in the vicinity of the unit are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground of the service equipment.

Do not attach the power cord to the plotter or to a power source until after you have determined the plotter's operating voltage setting (100, 120, 220, or 240 Vac). (See Table 1-1 for the minimum and maximum operating ranges for these voltage ratings and the required fuse ratings.)

To check the voltage setting, locate the power entry module shown in Figure 1-1. Your plotter may be equipped with either of two power entry modules. The following paragraphs explain how to check the voltage settings of both types of modules.

On one type of power entry module, the cover shows four possible voltage settings (100V, 120V, 220V, or 240V). Notice that a pin will be in one of these holes, indicating the present voltage setting for the plotter. If this setting does not match the voltage available at your site, then it must be changed before powering on the plotter (see Paragraph 5.2).

The other type of module has a fuse cavity behind a clear plastic cover. Inside the cavity is a numbered (100, 120, 220, or 240) voltage select board. The number visible on the voltage select board indicates the present voltage setting of the plotter. If this setting does not match the voltage available at your site, then it must be changed before powering on the plotter (see Paragraph 5.2).

The plotter's ground circuitry protects you from electrical shock. However, this protection is effective only if the ac outlet to be used is properly grounded to earth. If the plotter is to be connected to a two-contact wall outlet, a 3/2 adaptor with grounding lug/wire may be used. This type of connection is illustrated in Figure 1-3.

Be sure to read the important safety instructions in the front of this manual before operating the plotter.
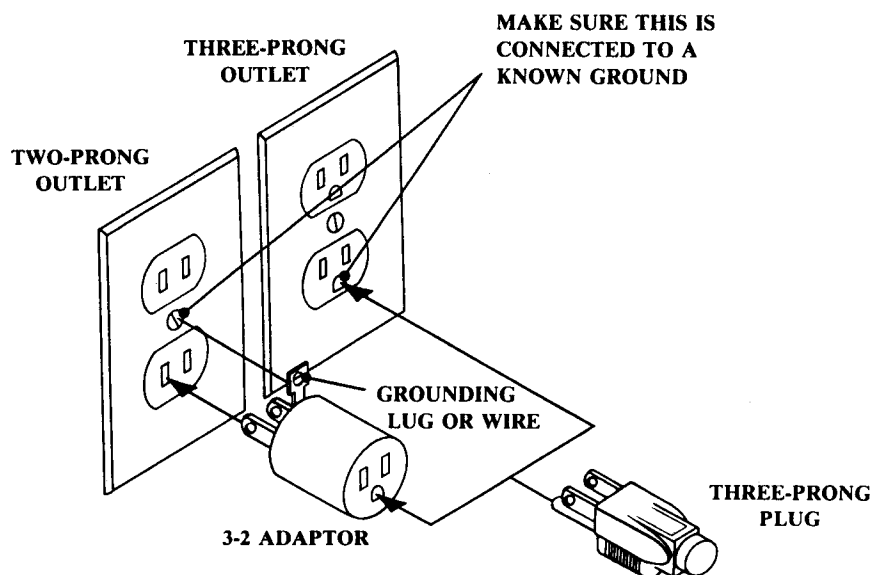

FIGURE 1-3. GROUND CONNECTION

WARNING

To prevent personal injury when operating the plotter, keep your hands, hair, and clothing away from the platen and the chart drive shaft.

To power up the plotter:

1. Be sure the plotter is properly attached to its floor stand.

2. Connect one end of the power cord to the plotter's bottom panel ac receptacle, which is next to power entry module.

3. Connect the other end of the power cord to the ac power source.

4. Set the front panel power switch to ON.

NOTE

If the plotter is powered up without a chart installed, the RESET and the LOAD LEDs will flash on and off. This indicates that no chart is installed and this is normal. If a chart is installed and the plotter is powered up, the RESET indicator will illuminate while the plotter automatically sizes the chart. After the chart is sized, the RESET indicator will turn off and the LOAD indicator will illuminate and remain on. This indicates that the plotter is in remote mode and this is normal. However, if the plotter displays any other code after it is powered up, an error may have occurred. Appendix A explains all of the possible LED codes.

Powering up the plotter causes a complete reset to occur. Complete and partial resets are explained in Paragraph 2.1.3.

NOTE
The DMP-61 maximum pen down velocity is 32 ips. However, this velocity has been set in the menu at the factory to 24 ips to ensure best plot quality with all media/pen combinations. Refer to *The Perfect Plot!* (part number MI-1098) for more information on plot specifications for different media/pen combinations.

Read the remainder of this manual and follow its instructions before attempting to operate the plotter.

1.7   MEDIA LOADING

WARNING
To prevent personal injury when operating the plotter, keep your hands, hair, and clothing away from the platen and the chart drive shaft.

The media for your plotter is packaged in airtight plastic wrapping. After opening the package, let smaller size media sit for at least 20 minutes before using and larger size media for at least one hour. This allows the media to stabilize to the surrounding humidity. (If the media is not allowed to stabilize to the environment before use, the resulting plot may have mismatched lines, line shifts, or offsets. This is a result of the media expanding and contracting during plotting.) Handle the chart by its edges only! Fingerprints leave a slight residue on the media which may cause the pens to skip over those areas.

Both plotter models have threaded holes on their platen to which the left pinch roller assembly can be moved (see Figure 1-5). The DMP-61 has eight threaded holes and the DMP-62 has 20 threaded holes. By using the menu to rotate the plot origin to the right or left, all of the positions on the DMP-61 and most of the positions on the DMP-62 can accommodate a *small* chart or a *large* chart. A small (half) chart orientation exists when the length of the pen axis is longer than the length of the chart axis. A large (full) chart orientation exists when the length of the chart axis is longer than the length of the pen axis. The menu also has an option which allows the plotter to automatically select the correct plot origin for a particular chart. The menu parameters and options are explained in Paragraph 2.4.

NOTE

The DMP-62 has five threaded holes on the platen which can be used to load oversized or undersized nonstandard media. These holes are positions 11, 13, 15, 17, and 19. (The threaded hole positions are referenced from right-to-left in this section.) These platen holes may also be used to improve the tracking of standard media which may have contracted due to certain environmental conditions. (Use hole positions 12, 14, 16, 18, and 20 for standard media.) If media is stored or used in any area having a low humidity and low temperature environment, such as an air-controlled computer mainframe area, the media will contract. If these holes are used for standard media, it is important to note the following considerations:

- The plot area of that media will be slightly reduced,

- If the plotting software expects a standard media size, the resulting plot may be clipped.

The DMP-61 standard chart sizes for each threaded hole position are listed in Table 1-7. Table 1-8 lists the standard chart sizes for the DMP-62. (Also listed in Table 1-8 are the five DMP-62 threaded hole positions for media that has contracted.) Note that the threaded hole positions are referenced from right-to-left in this section. The maximum plot areas for the charts are listed in Table 1-9.

NOTE

For proper operation, use only media that is flat and does not curl.

TABLE 1-7. DMP-61 STANDARD CHART SIZES

THREADED HOLE POSITION	LEFT PLOT ORIGIN (Small Chart)	RIGHT PLOT ORIGIN (Large Chart)
Position 1 (Engineering A — B)	Engineering A 8.5 inches × 11 inches	Engineering B 11 inches × 17 inches
Position 2 (A4 — A3 DIN)	A4 DIN 210 mm × 297 mm	A3 DIN 297 mm × 420 mm
Position 3 (Architectural A — B)	Architectural A 9 inches × 12 inches	Architectural B 12 inches × 18 inches
Position 4 (Oversize A4 — A3)	Oversize A4 240 mm × 330 mm	Oversize A3 330 mm × 450 mm
Position 5 (Engineering C — D)	Engineering C 17 inches × 22 inches	Engineering D 22 inches × 34 inches
Position 6 (A2 — A1 DIN)	A2 DIN 420 mm × 594 mm	A1 DIN 594 mm × 841 mm
Position 7 (Architectural C — D)	Architectural C 18 inches × 24 inches	Architectural D 24 inches × 36 inches
Position 8 (Oversize A2 — A1)	A2 Oversize 450 mm × 625 mm	A1 Oversize 625 mm × 880 mm

TABLE 1-8. DMP-62 STANDARD CHART SIZES

THREADED HOLE POSITION	LEFT PLOT ORIGIN (Small Chart)	RIGHT PLOT ORIGIN (Large Chart)
Position 1 (Engineering A — B)	Engineering A 8.5 inches × 11 inches	Engineering B 11 inches × 17 inches
Position 2 (A4 — A3 DIN)	A4 DIN 210 mm × 297 mm	A3 DIN 297 mm × 420 mm
Position 3 (Architectural A — B)	Architectural A 9 inches × 12 inches	Architectural B 12 inches × 18 inches
Position 4 (Oversize A4 — A3)	Oversize A4 240 mm × 330 mm	Oversize A3 330 mm × 450 mm
Position 5 (Engineering C — D)	Engineering C 17 inches × 22 inches	Engineering D 22 inches × 34 inches
Position 6 (A2 — A1 DIN)	A2 DIN 420 mm × 594 mm	A1 DIN 594 mm × 841 mm
Position 7 (Architectural C — D)	Architectural C 18 inches × 24 inches	Architectural D 24 inches × 36 inches
Position 8 (Oversize A2 — A1)	A2 Oversize 450 mm × 625 mm	A1 Oversize 625 mm × 880 mm
Position 9 (B1 DIN)	——	B1 DIN 707 mm × 1000 mm
Position 10 (Architectural/Engineering F)	Architectural/Engineering F 28 inches × 40 inches	——

TABLE 1-8. DMP-62 STANDARD CHART SIZES (Continued)

THREADED HOLE POSITION	LEFT PLOT ORIGIN (Small Chart)	RIGHT PLOT ORIGIN (Large Chart)
Position 11 (Contracted Architectural 30 × 42)	——	Architectural 30/42 30 inches × 42 inches
Position 12 (Standard Architectural 30 × 42)	——	Architectural 30/42 30 inches × 42 inches
Position 13 (Contracted A0 DIN)	——	A0 DIN 841 mm × 1189 mm
Position 14 (Standard A0 DIN)	——	A0 DIN 841 mm × 1189 mm
Position 15 (Contracted Engineering E)	——	Engineering E 34 inches × 44 inches
Position 16 (Standard Engineering E)	——	Engineering E 34 inches × 44 inches
Position 17 (Contracted Oversize A0)	——	Oversize A0 880 mm × 1230 mm
Position 18 (Standard Oversize A0)	——	Oversize A0 880 mm × 1230 mm
Position 19 (Contracted Architectural E)	——	Architectural E 36 inches × 48 inches
Position 20 (Standard Architectural E)	——	Architectural E 36 inches × 48 inches

The following procedure explains how to install charts. The RESET and LOAD LED indicators will flash on and off during this procedure. This signal indicates that the plotter is out of media. After the chart is properly inserted and then loaded by pressing the RESET or the LOAD key, the signal will stop.

NOTE

The plotter uses vacuum to keep the center area of the media clear of the pen. The vacuum motor is activated by the plotter's power switch.

1.   Raise the pinch roller arm of the left pinch roller assembly. Loosen the thumbscrew on top of the left pinch roller assembly by turning it counterclockwise until the pinch roller assembly can slide freely on the beam (see Figure 1-4).

CAUTION

Be sure to raise the left pinch roller assembly from the drum before moving the roller assembly to a different threaded hole position. Otherwise, the friction of the drum may create a flat spot on the roller wheel.
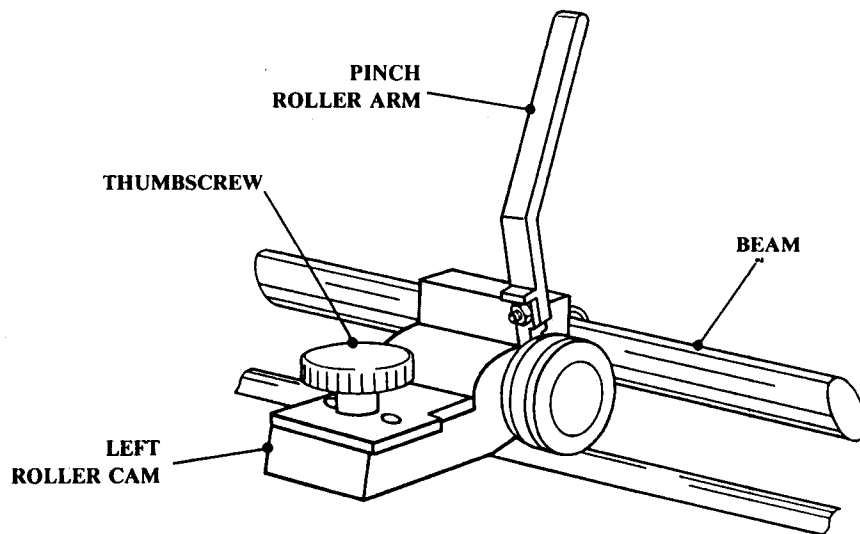
PINCH
ROLLER ARM

THUMBSCREW

BEAM

LEFT
ROLLER CAM

FIGURE 1-4. LEFT PINCH ROLLER ASSEMBLY THUMBSCREW

2. Slide the left pinch roller assembly to the desired threaded hole position. Be sure that the thumbscrew is aligned with the threaded hole, and then tighten the thumbscrew in the threaded hole by turning it clockwise until it is finger-tight.

CAUTION
Be sure that the thumbscrew is aligned with the threaded hole before tightening the thumbscrew. Otherwise, the thumbscrew may strip the threads of the platen hole.
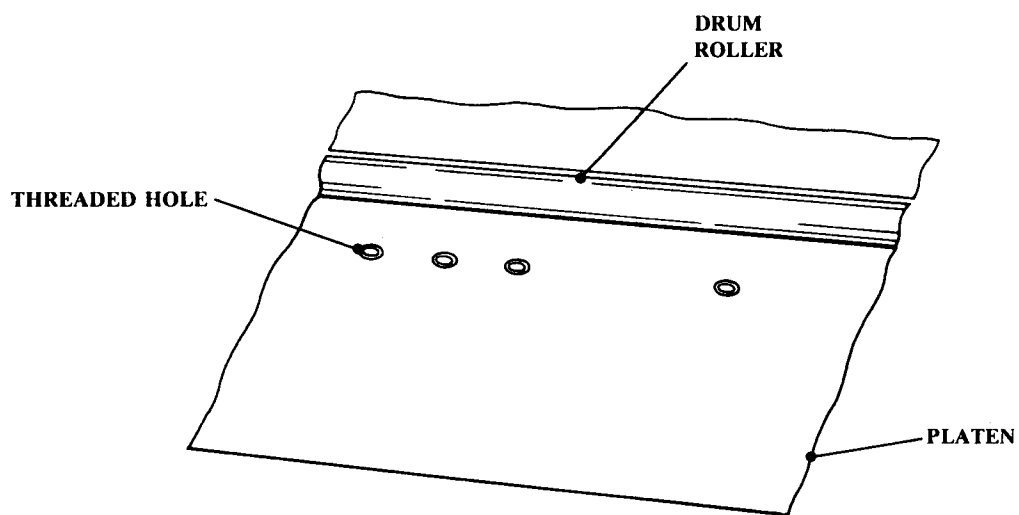
FIGURE 1-5. THREADED HOLES ON PLATEN

3.   Raise the pinch roller arm of the right pinch roller assembly. Refer to Tables 1-7 or 1-8 to determine if the chart size you are loading requires small chart (left plot origin) or large chart (right plot origin) format. If small chart format is required, insert the media as shown in Figure 1-6. If large chart format is required, insert the media as shown in Figure 1-7.
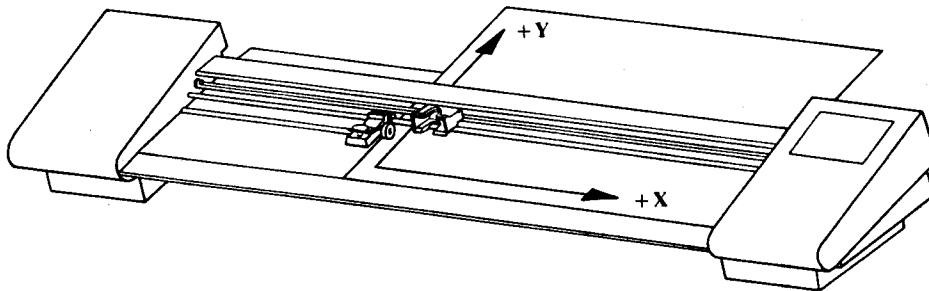
This example shows size C media loaded (left pinch roller assembly in position 5 and the pen holder at left plot origin).

Align the edge of the chart with the groove on the platen and the white line on the right side of the platen.

FIGURE 1-6. LOADING SMALL CHARTS
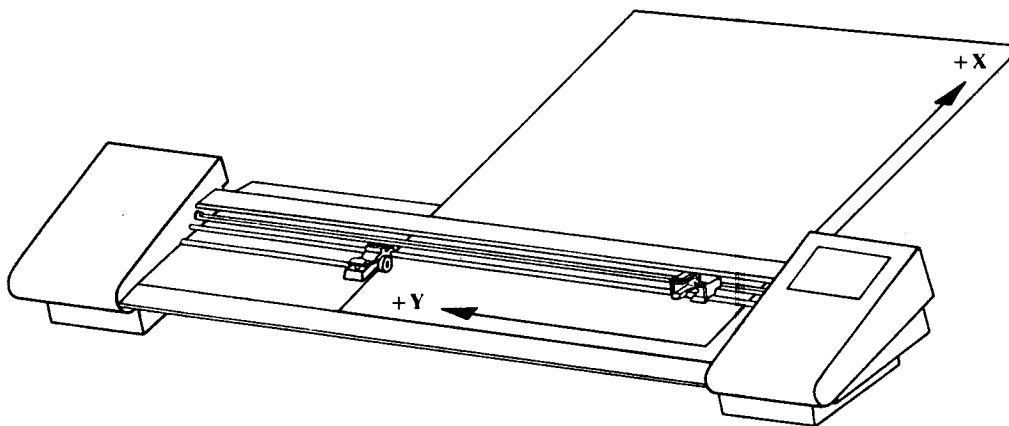
This example shows size D media loaded (left pinch roller assembly in position 5 and the pen holder at right plot origin).

Align the edge of the chart with the groove on the platen and the white line on the right side of the platen.

FIGURE 1-7. LOADING LARGE CHARTS

4. Align the right edge of the chart with the inside of the white line on the right side of the plotter and align the front edge of the chart with the groove on the front of the plotter. Then close both pinch roller arms. (Appendix D lists environmental considerations for the plotting media.)

5. Press the LOAD key. The plotter is set at the factory to automatically select the correct plot origin for the chart installed. It does this by first moving the pen holder to the right until it locates the right stop and then to the left until it locates the left stop. The pen holder then returns to the right side of the pen bar. The media is then moved forward until its rear edge is detected by the platen sensor, and is then returned to the load position. If the plotter senses that a chart is longer than it is wide, it automatically selects right plot origin, or large chart format. If it senses that the chart is wider than it is long, it selects left plot origin, or small chart format. (A left plot origin or a right plot origin can be manually specified in the menu to override the automatic chart size feature, if desired.)

6. The media is now properly loaded, and the RESET indicator will turn off and the LOAD indicator will illuminate.

The left pinch roller assembly can be moved to change media sizes at any time except when the plotter is drawing a plot, operating in menu mode (see Paragraph 2.4), or operating in Manufacturing Setup Mode (MSM) (see Appendix B). If the chart size is changed by more than one-quarter inch, the plotter will automatically reset when the RESET or the LOAD key is pressed.

Table 1-9 lists the maximum plotting area for each standard chart size.

TABLE 1-9. MAXIMUM PLOTTING AREAS

CHART SIZE	PLOT AREA	PLOT ORIGIN
Architectural A	7.8 × 10.8 inches	Left
Architectural B	10.8 × 16.8 inches	Right
Architectural C	16.8 × 22.8 inches	Left
Architectural D	22.8 × 34.8 inches	Right
Contracted Architectural E	34.5 × 46.5 inches	Right
Architectural E	34.8 × 46.8 inches	Right
Architectural F	26.8 × 38.8 inches	Right
Contracted Architectural 30 × 42 inches	28.5 × 40.5 inches	Right
Architectural 30 × 42 inches	28.8 × 40.8 inches	Right
Engineering A	7.3 × 9.8 inches	Left
Engineering B	9.8 × 15.8 inches	Right
Engineering C	15.8 × 20.8 inches	Left
Engineering D	20.8 × 32.8 inches	Right
Contracted Engineering E	32.5 × 42.5 inches	Right

TABLE 1-9. MAXIMUM PLOTTING AREAS (Continued)

CHART SIZE	PLOT AREA	PLOT ORIGIN
Engineering E	32.8 × 42.8 inches	Right
Engineering F	26.8 × 38.8 inches	Right
DIN A4	179 × 266 mm	Left
DIN A3	266 × 389 mm	Right
DIN A2	389 × 563 mm	Left
DIN A1	563 × 810 mm	Right
Contracted DIN A0	802 × 1150 mm	Right
DIN A0	810 × 1158 mm	Right
DIN B1	676 × 969 mm	Right
Oversize A4	209 × 299 mm	Left
Oversize A3	299 × 419 mm	Right
Oversize A2	419 × 594 mm	Left
Oversize A1	594 × 849 mm	Right
Contracted Oversize A0	841 × 1191 mm	Right
Oversize A0	849 × 1199 mm	Right

All standard and nonstandard chart sizes have the same margin area between the maximum plotting area and the edges of the chart (see Figure 1-8). Note that the left and right margin areas may not be exactly the same on both sides but the sum of both margins always equals 1.2 inches (30 mm). Where the chart is loaded determines the amount of margin area on each side of the chart. The sum of the top and bottom margins also equals 1.2 inches (30 mm).

The DMP-60 also enables you to cut a standard sheet of chart media into a nonstandard size and plot on it. The only restrictions for using nonstandard chart sizes are:

- The right-to-left length of the chart along the platen must be a standard size. The right edge of the chart must be aligned with the inside of the white line on the right side of the plotter and the front edge of the chart must be aligned with the groove on the front of the plotter.

- The front-to-back length of the chart must be greater than 8 inches (203 mm) and less than 50 inches (1270 mm) to ensure proper tracking.

- The margin between the maximum plot area and the edges of the chart are the same as the margins on standard chart sizes.
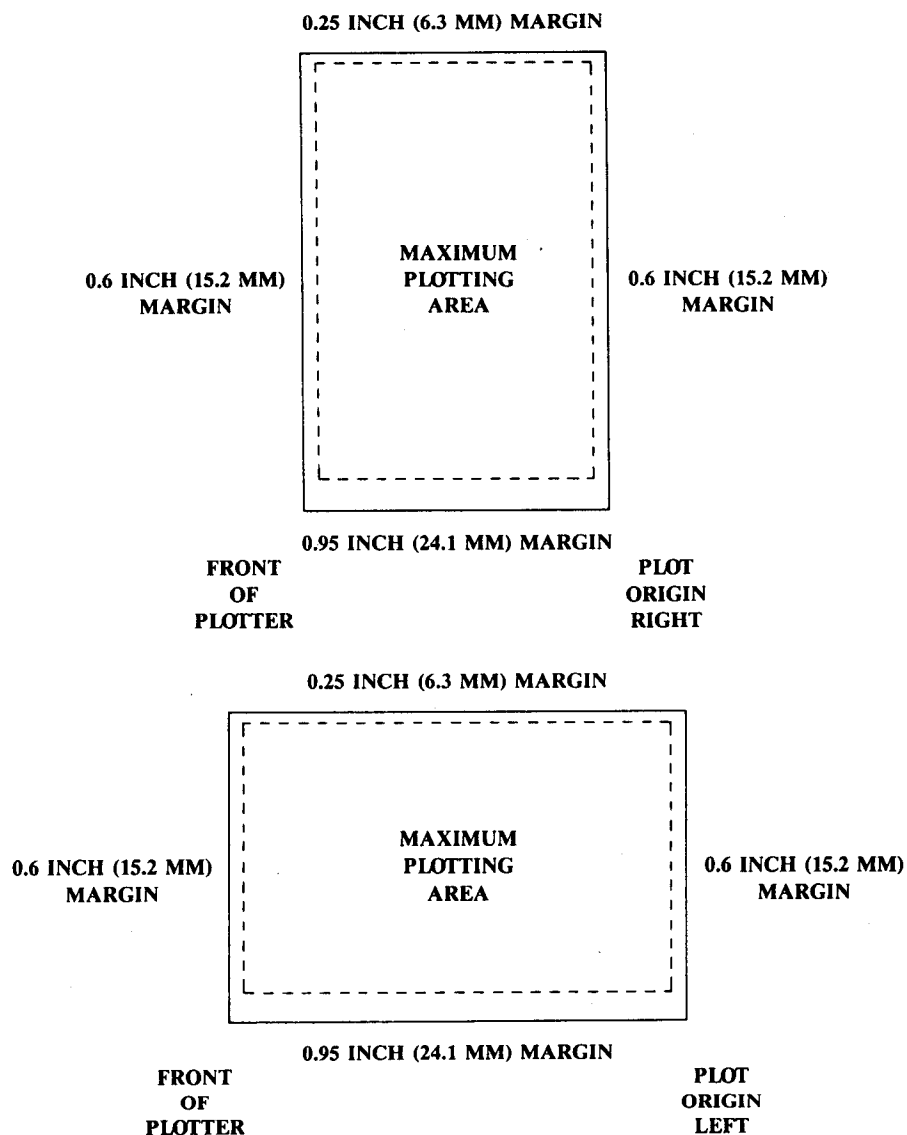
0.25 INCH (6.3 MM) MARGIN

0.6 INCH (15.2 MM)
MARGIN

MAXIMUM
PLOTTING
AREA

0.6 INCH (15.2 MM)
MARGIN

0.95 INCH (24.1 MM) MARGIN

FRONT
OF
PLOTTER

PLOT
ORIGIN
RIGHT

0.25 INCH (6.3 MM) MARGIN

0.6 INCH (15.2 MM)
MARGIN

MAXIMUM
PLOTTING
AREA

0.6 INCH (15.2 MM)
MARGIN

0.95 INCH (24.1 MM) MARGIN

FRONT
OF
PLOTTER

PLOT
ORIGIN
LEFT

FIGURE 1-8. CHART MARGINS

1.8   PENS

The pens that are supplied with your plotter are disposable stainless steel technical drafting pens specially designed for your plotter. A variety of pen tip sizes and other plotting accessories are listed in Paragraph 1.2.1.

The following procedure explains how to install and use disposable stainless steel and tungsten tip technical drafting pens.

1.   Insert a pen tip into each ink cartridge and then place a cap on each pen. To use a pen for the first time, press downward on the pen cap to push the nib into the body of the ink cartridge to break its seal. See Figure 1-9.

2.   After the seal is broken, the ink will slowly drain between the ribs of the pen tip and the ink cartridge. If the ink does not appear, activate the pen again as described in step 1. Remove and save the pen cap.

3.   Hand draw on scrap H.I.-Frost (opaque bond) or vellum to verify its operation.

4.   Screw the pens into the adaptors (the pens only fit into the adaptors the correct way). The pens are ready for use.

5.   When a pen is not in use, cap and store it in the storage box in a vertical position (pen tip up). Use the short blue pen cap if the pen is in the adaptor. Use the long clear pen cap if the pen is not in the adaptor. Before using the pen again, sharply tap the pen body (not the tip) on a hard surface to restart the flow of ink.
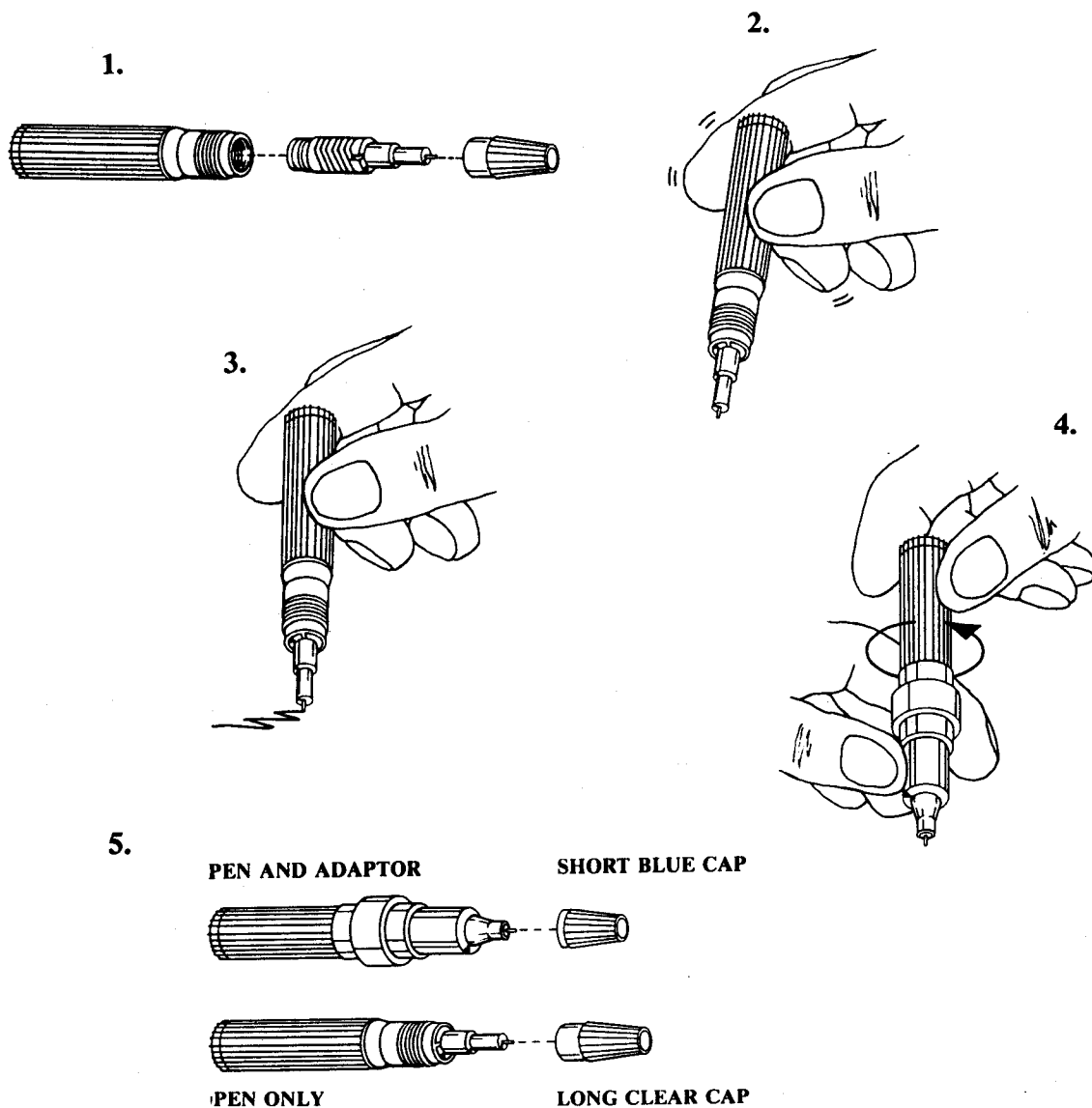
1.

2.

3.

4.

5.

PEN AND ADAPTOR

SHORT BLUE CAP

PEN ONLY

LONG CLEAR CAP

FIGURE 1-9.
DISPOSABLE STAINLESS STEEL OR TUNGSTEN DRAFTING PEN

1.8.1   Pen Care

The following paragraphs describe the simple pen care requirements for the plotter pens.

All plotter pen types must be capped when not in actual use. If the plotter has the optional multi-pen changer accessory installed, disposable and refillable drafting pens may be stored in the pen stalls. (Hard nib and roller ball pens are not capped in the pen changer unit.) For long-term storage, you may also store the pens by removing them from the pen stalls, capping them with the provided caps, and sealing them in a plastic bag. Drafting pens that have been unused for a few days should be checked for ink flow before use, whether they have been individually capped or stored in a pen stall.

1.8.1.1   Hard Nib and Roller Ball Pens

The hard nib and roller ball pens are disposable pens that have no particular care requirements other than to keep them capped when they are not in actual use. (These pens are not capped in the optional multi-pen changer accessory.) Test the pen on a piece of scrap plotting material to verify operation.

A hard nib pen with dried ink can sometimes be saved by dipping the pen point in water, then rubbing the point on scrap media to restart ink flow.

1.8.1.2   Disposable Stainless Steel and Tungsten Drafting Pens

The stainless steel and tungsten drafting pens are disposable technical pens that have no particular care requirements other than to keep them capped when they are not in actual use or they are not stored in the optional multi-pen changer accessory. Cap the pen with the short blue cap if the pen is inserted in an adaptor as described in Paragraph 1.8. Otherwise, cap the pen with the long clear cap.

You must first activate the pens before using them for the first time. This is explained in Paragraph 1.8.

The disposable drafting pens work equally well on matte film and vellum at high acceleration and velocity rates. Since there is pen tip wear, it is recommended that the pens be used on one type of media for the life of the pen. If you use both matte film and vellum, use one pen set for film and one set for vellum to obtain the best plot quality and to prevent damage to the media.

There are no special cleaning requirements for these pens. A pen with dried ink can often be restarted by holding the pen point upward and sharply tapping the reservoir against a hard surface several times. Capping a dried pen for a few days may allow the ink to dissolve the clog. Also, these pens can often be restarted by dipping the pen point in water or an ultrasonic cleaner, then rubbing the point on scrap plotting media.

1.8.1.3 Refillable Tungsten Pen

The tungsten pens are refillable technical pens for plots on vellum or film. Refer to Figure 1-10. These pens should be capped when not in actual use. The pens are automatically capped when installed in the stable assembly of the multi-pen changer accessory. Like any technical drawing pen, these pens must be occasionally cleaned and filled with ink for proper operation.

To fill the pen, remove the pen reservoir and add ink, up to the fill line as shown in Figure 1-10. For best results, do not fill past this line. Also note that these pens should be refilled before the reservoir is empty. To start the flow of ink, turn the pen point downward and gently tap the top of the reservoir. Test the pen on a piece of scrap plotting material to verify operation. Then install an adaptor on the pen body for use in the plotter. Never shake the pen as this may cause the ink to clog the air vents and prevent the flow of ink.

CAUTION
If the pen tip is taken apart, be very careful not to bend the cleaning wire inside the tip.

For best results, remove the ink reservoir and thoroughly clean the pen tip after each use using an ultrasonic drafting pen cleaner and solution. Wash the reservoir in tap water. Then thoroughly dry the parts and reassemble the pen. Pen care products are available from any drafting supply store. Note that you should thoroughly clean a pen if you plan to use another ink color in it.

A tungsten pen with dried ink can sometimes be restarted by dipping the pen point in water or denatured alcohol, then rubbing the point on scrap plotting media.
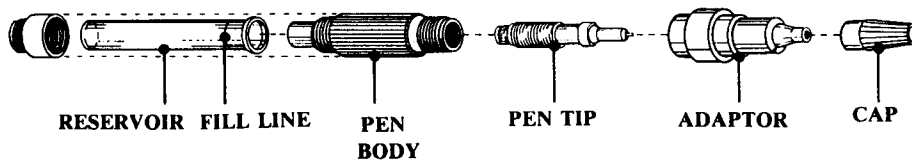

RESERVOIR FILL LINE   PEN   PEN TIP   ADAPTOR   CAP
                       BODY

FIGURE 1-10. REFILLABLE TUNGSTEN PEN

1.9   SERIAL RS-232-C INTERFACE

The serial RS-232-C interface enables the plotter to be connected to and controlled by an RS-232-C-compatible host computer system. The plotter is equipped with a standard RS-232-C DB-25P connector on its rear panel (see Figures 1-1 and 1-11) and requires a standard RS-232-C DB-25S mating connector.
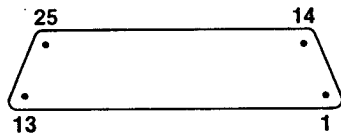

FIGURE 1-11. REAR PANEL RS-232-C CONNECTOR

The plotter's RS-232-C circuitry is considered as DTE type equipment, which means *the plotter always transmits data on pin 2 and receives data on pin 3.* Table 1-10 lists the active signals/pins on the plotter's RS-232-C connector and their direction of travel. Each signal is explained below.

● Transmit Data, pin 2. The plotter uses this pin to transmit data to the computer while operating in DM/PL Mode One XON/XOFF or DM/PL Mode Two or the HPGL Handshake Modes, or any DM/PL or HPGL command that sends data to the computer.

● Receive Data, pin 3. The plotter *always* receives data from the computer on this pin.

● Request To Send (RTS), pin 4, and Data Terminal Ready (DTR), pin 20. These two pins are internally connected in the plotter. This signal is used during Mode One hardware handshaking. A high signal level tells the computer that the plotter is ready for more data (the plotter buffer is not full). A low signal level tells the computer to wait until the plotter can accept more data (the buffer is full). Some computer models require a constant high signal level from these two pins. If this requirement applies to your computer, a constant high signal level at pin 4 (RTS) and pin 20 (DTR) can be specified from the menu (see Paragraph 2.4).

● Signal Ground, pin 7. Required signal ground.

TABLE 1-10. PLOTTER'S RS-232-C CONNECTOR SIGNALS (DTE)

PIN NUMBER AND SIGNAL NAME	SIGNAL DIRECTION
PIN 1—Chassis (earth) ground	Common
PIN 2—Transmit data (TD)	From Plotter
PIN 3—Receive data (RD)	To Plotter
PIN 4—Request To Send (RTS)*	From Plotter
PIN 7—Signal (board) ground	Common
PIN 14—Auxiliary Transmit Data†	To Plotter
PIN 16—Auxiliary Receive Data†	From Plotter
PIN 20—Data Terminal Ready (DTR)*	From Plotter

*PINS 4 and 20 are internally jumpered, and the signal levels can be specified from the menu to either toggle or remain high.

†See Paragraph 1.9.1.

The remainder of this section includes instructions on how to fabricate data cables for various types of handshaking and how to connect them to the plotter and the computer. Read this section thoroughly even if you have purchased our factory prefabricated cables—the information may be useful in the future if you decide to replace your computer system or use the plotter on another system that has a different handshake sequence. Before attempting to connect the plotter to your system, consult the computer owner's manual and determine what your computer's interface signal requirements are. (If your software gives a cable configuration, you must use that connection.) In general, you'll need to know:

- Which RS-232-C I/O port is recommended by your computer's manufacturer for use with other external equipment?

- Is your computer considered as DCE or DTE type equipment?

- What is the cable configuration that is required by your software to perform handshaking functions?

- Does your computer/modem require Request To Send (RTS) and/or Data Terminal Ready (DTR) signal response?

NOTE

If you have a problem interfacing the plotter and the computer (DM/PL active), activate the plotter's communication error checking routine by entering the DM/PL menu and selecting the *REPORTED* option for the *COMM ERRORS* parameter (see Paragraph 2.4). The communication error checking routine allows the plotter to detect and identify data line problems. If problems are detected, error codes are displayed on the control panel LEDs (see Appendix A). If the communication error routine is used, be sure the computer program does not use automatic baud rate selection (auto-baud). Otherwise, auto-baud will trigger unnecessary baud rate error codes as it attempts to match baud rates.

After a good communication link has been established, deactivate the communication error checking routine by selecting the *IGNORE* option for the DM/PL menu *COMM ERRORS* parameter. Although the plotter will operate with the routine activated, it is not necessary to have the routine active during normal operation.

If you did not purchase factory prefabricated data cables with your plotter, you may consider making a cable specifically for the type of handshake used by your computer and software before trying to set up a communication link using any spare RS-232-C cable that you may have. Because of the many misinterpretations of the RS-232-C "standards" in the commercial computer industry, a working cable on one system or software may prove useless on another.

Cable fabrication is inexpensive and requires very little technical skill. Your local dealer or electrical parts house can supply you with the cable wires, end connectors, and the tools you will need to construct a quality cable. When constructing a data cable, always shield each individual signal wire, as well as the entire cable, to prevent internal "cross-talk" and electrical noise from occurring. The mating connector for the plotter's rear panel connector must be an RS-232-C DB-25S connector. Your computer owner's manual will supply the type of mating connector required for your equipment. The overall length of a data cable should be limited to 15 feet (4.6 meters).

The number of signal wires required in your cable and the pin numbers on the end connector you should connect them to depends on the device type of your equipment (DCE or DTE) and the type of handshaking required. Specific interface instructions for many popular computer models are listed in Appendix E.

WARNING

RS-232-C DB-25 connectors use pin 1 for chassis ground. Although this signal is not required for operation, its function is similar to the earth ground prong on three-contact ac plugs. Regardless of the type of cable you construct, it is highly recommended to always connect pin 1, chassis ground, at both end connectors.

Use the menu to specify baud rate and parity (see Paragraph 2.4).

Before you connect the plotter to your computer system with the data cable, check the computer owner's manual for cabling precautions from its manufacturer, and power down the plotter. Plug one end of the data cable into the computer's RS-232-C I/O port connector, and then plug the other end of the cable into the plotter's rear panel RS-232-C data connector. Power up the plotter and then the computer system.

1.9.1 (RS-232-C) Pass-Through Port Feature

The pass-through port feature enables you to transmit the data received by the plotter from the host computer to an auxiliary CRT device.

To connect an auxiliary CRT device to the host computer/plotter configuration, three additional signal wires must be connected from the plotter's rear RS-232-C connector to the CRT. These signal connections are shown in Table 1-11.

TABLE 1-11. RS-232-C PASS-THROUGH PORT SIGNAL CONNECTIONS

COMPUTER SIGNAL PIN (DCE)	PLOTTER SIGNAL PIN (DTE)	AUXILIARY (CRT) SIGNAL PIN (DTE)
PIN 1 (CHS GRD) TO PIN 2 (RD) TO PIN 3 (TD) TO PIN 7 (SIG GRD) TO	PIN 1 (CHS GRD) TO PIN 2 (TD) PIN 3 (RD) PIN 7 (SIG GRD) TO PIN 14 (ATD) TO PIN 16 (ARD) TO	PIN 1 (CHS GRND) PIN 7 (GRND) PIN 2 (ATD) PIN 3 (ARD)

CHS GRD = Chassis Ground
RD = Receive data
TD = Transmit data
SIG GRD = Signal Ground
ATD = Auxiliary Transmit Data
ARD = Auxiliary Receive Data

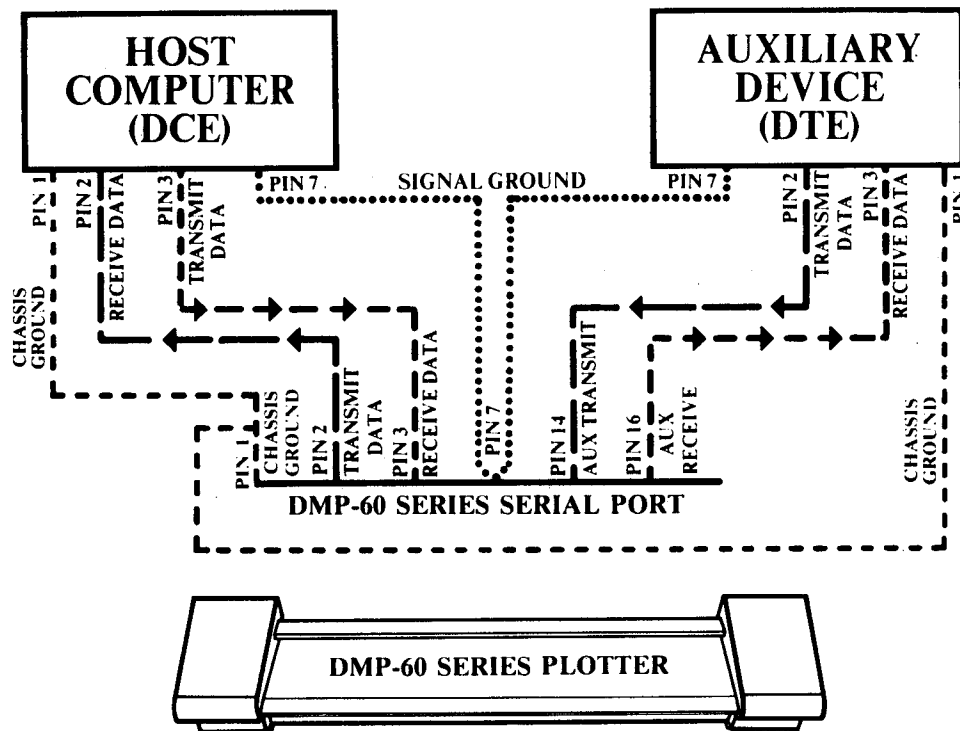An illustration of this type of connection is shown in Figure 1-12.

FIGURE 1-12. PASS-THROUGH PORT CONFIGURATION

After the signal connections are made, the type of control you want for the pass-through port data from the plotter (pin 16) to the CRT (pin 3) can be specified in the DM/PL menu (see Paragraph 2.5). If the *ALWAYS ON* option is selected for the *PASS-THROUGH PORT* DM/PL menu parameter, this feature will remain active. If the *TOGGLE* option is selected, this feature can be toggled on by using the DM/PL Pass-Through Port (X) command.

CAUTION
Use only pins 14, 16, and 7 to connect an auxiliary device to the plotter. If an auxiliary device is connected to the plotter and XON/XOFF (Mode One) handshaking is used, make certain that the device connected to the plotter's pass-through port does not transmit an XON/XOFF handshake while the plotter is operating. This may cause the host computer to respond to the wrong handshake signal and transmit erroneous plot codes.

1.10   DM/PL DIGITIZE MODE

NOTE
If you are operating with HPGL, refer to Section 4 for HPGL Digitize mode information.

DM/PL Digitize mode enables the plotter to transmit the x-,y-coordinate of the present position of the pen to the computer for processing. This information is transmitted on pin 2 of the plotter's interface. Digitize mode must be activated by entering the DM/PL Digitize (ED) command from the computer (see the DM/PL manual).

Your computer must be programmed to receive the x-,y-coordinate data, which is ASCII BCD format, from the plotter. (Consult your computer's software manual for programming instructions.) The data from the plotter consists of two, six-digit, signed[1] coordinates in parentheses, followed by a carriage return <CR> terminator.

The following is an example of a digitized x-,y-coordinate data point:

(001200, 000850) <CR>

After the plotter receives an ED command, it switches to local mode (the LOAD and LOCAL indicators are on) and the ENTER indicator flashes on and off. The ◄, ▲, ►, and ▼ keys can then be used to move the pen to the location of the point to be digitized. (The CLIP LL, CLIP UR, SCALE LL, and SCALE UR keys can also be used to move the pen to the present window/scale box points.)

[1] A positive value is signed with a "space," and a negative value is signed with a minus (-) sign.

After the pen is positioned, press ENTER, and the plotter will transmit the position of the pen to the computer. The ENTER indicator will then turn off, and the plotter will beep and return to remote mode. (After the plotter enters remote mode, the pen will return to the location where it was prior to the ED command.) Repeat this procedure for each point to be digitized.

The following sample program demonstrates the use of the digitizing function of the plotter. The program is for an IBM PC™ using BASIC.™ Before running this program, use the plotter DM/PL menu to set 9600 baud and even parity (see Paragraph 2.5).

IBM PC:

```
20 OPEN "COM1:9600,E,7,2,CS,DS " AS #1
30 PRINT #1," ;: H"
40 FOR I = 1 TO 10
50 PRINT #1,"ED"
60 INPUT #1,X$,Y$
65 X=VAL(RIGHT$ (X$,6)):Y=VAL(LEFT$(Y$,6))
70 PRINT X,Y
80 NEXT I
90 PRINT #1," Z"
100 END
```

Line 20 — configures the serial port for input and output

Line 30 — initializes the plotter and sends the pen to Home position

Line 40 — FOR loop that allows ten points to be digitized

Line 60 — inputs x- and y-coordinates from the plotter

Line 65 — decodes x- and y-coordinates

Line 70 — prints x- and y-coordinates to the screen

Line 80 — NEXT statement for FOR loop in line 40

Line 90 — software resets the plotter at the end of the buffer

1.11 THE ONE-MEGABYTE EXTENDED BUFFER BOARD ACCESSORY

The extended buffer board accessory enables you to expand the plotter buffer by an additional one-megabyte. When data is received at the plotter's RS-232-C port, it is automatically stored in the extended buffer if one is installed and is activated in the menu. The extended buffer board is activated for use with a desired plotting language by selecting the *ON* option of the *OPTION BOARD* parameter in either menu (see Paragraph 2.4).

To replot all of the data in the extended buffer, place the plotter in local mode by pressing the LOCAL key, and then press the ◄ and ► keys simultaneously. If the buffer is empty, the plotter will draw the Europlot design. The plotter will also draw the Europlot if more than one megabyte is sent to the buffer before resetting the plotter.

To plot a string of DM/PL files from the extended buffer, first clear all previous data from the buffer by pressing the RESET key. If you want each DM/PL file to be plotted on separate charts, your software must include a DM/PL End of Plot (e) command at the end of each file. (Some applications, such as multi-layered pc board plots, require different files to be plotted on the same chart. To create these types of plots, the software should not use the DM/PL End of Plot command in the plot code.)

To plot the first file in the string, press the LOCAL key and then the ◄ and ► keys simultaneously. After the first file is plotted, the DM/PL End of Plot command will cause the DMP-60 to stop and flash the plot command condition code on the LEDs. (The plot command condition code causes the RESET LED to flash on and off as explained in Appendix A.) After changing charts and pressing the LOAD key to load the media, press the LOCAL key to continue. The plotter will automatically size the chart and begin plotting the next plot file stopping at each End of Plot command until the buffer has been completely replotted. After the last file is plotted, the string of buffer files can then be restarted. If end of plot commands are not present, the buffer files will plot over each other. The buffer files must be plotted sequentially. For example, to plot buffer file number three, the two preceding files must be plotted first.

The extended buffer also enables you to plot one file several times without having to reload it each time from the computer. Reset the plotter to clear the buffer of all previous data. After you have loaded the file into the extended buffer, you can plot it as many times as you need by pressing LOCAL, and then ◄ and ► simultaneously. (Use only the LOAD key to load new media when changing charts. The RESET key will empty the extended buffer.)

To clear all data from the extended buffer, press the RESET key.

The extended buffer board RAM is checked by the plotter at each power up. If an error is detected in the RAM at power up, the LOAD and LOCAL indicators will flash on and off as shown below.

☐   ✳   ✳   ☐

If a RAM error occurs, service is required (see Paragraph 5.3).

SECTION 2
OPERATION

2.1   THE CONTROL PANEL

The control panel consists of 12 membrane switch keys and four LED indicators (see Figure 2-1).
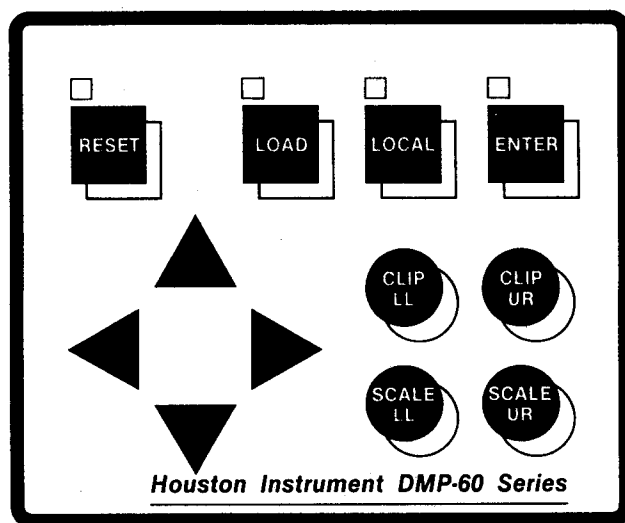
FIGURE 2-1. THE CONTROL PANEL

In general, the RESET key causes the plotter to cold reset, and the LOAD key causes the plotter to warm reset. The LOCAL and ENTER keys are used to place the plotter in either remote, local, menu, or window mode. The present operating mode of the plotter determines the functions of the remaining control keys. Control panel-selected operating parameters, such as windows and velocities, override DM/PL and HPGL menu options and DM/PL and HPGL-selected parameters. The control keys and the four operating modes are explained in the following paragraphs.

The RESET, LOAD, LOCAL, and ENTER keys have LED indicators that illuminate when their function is activated. The LED indicators also display certain operating modes and flashing error conditions and error codes. Table 2-1 provides a summary of these codes and their reference paragraphs.

TABLE 2-1. LED INDICATOR CODE SUMMARY

| LED INDICATOR | | | | CONDITION AND |
RESET	LOAD	LOCAL	ENTER	REFERENCE PARAGRAPH
Normal Operation				
□	■	□	□	Remote mode, 2.2
✳	✳	□	□	Out of media, 1.7
□	■	■	□	Local mode, 2.3
□	■	□	■	Menu mode, 2.4
□	■	■	■	Window mode, 2.8
□	■	■	✳	Digitize mode, 1.10
✳	□	✳	□	Pen pause, 2.4
□ = LED off		■ = LED on		✳ = LED flashing

TABLE 2-1. LED INDICATOR CODE SUMMARY (Continued)

LED INDICATOR				CONDITION AND
RESET	LOAD	LOCAL	ENTER	REFERENCE PARAGRAPH
Error Conditions				
□	✳	□	✳	Window error, A.3.2
✳	□	□	✳	Pen changer status change, A.3.3
✳	□	✳	✳	Pen changer error, A.3.3.1
□	□	□	✳	EEPROM error, A.4.1
□	□	✳	□	ROM error, A.4.2
□	□	✳	✳	RAM error, A.4.3
□	✳	□	□	Communication error, A.5
✳	✳	✳	□	Voltage error, A.6.1
✳	✳	✳	✳	Current error, A.6.2
□	✳	✳	□	Extended buffer error, A.7
□	✳	✳	✳	RS-232-C loopback test error, A.8
✳	✳	□	✳	Program error, A.9
✳	□	□	□	Plot Command Condition, A.10
□ = LED off		■ = LED on		✳ = LED flashing

2.1.1   The Reset Key

The RESET key causes the plotter to execute a complete reset as explained in Paragraph 2.1.3.

After RESET is pressed, a complete reset occurs and then the plotter determines the size of the presently loaded chart and positions it for use. The pen holder then parks at the plot origin and enters remote mode.

NOTE

When installing or replacing media of any size, the chart *must* be aligned with the front loading groove before pressing the RESET key. The plotter uses the position of the front loading groove as a reference to the front plot margin.

2.1.2   The Load Key

The LOAD key causes the plotter to perform the chart load routine and to partially reset as explained in Paragraph 2.1.3.

The LOAD key does not affect control panel entries such as window settings or temporary velocity selections. The extended buffer data is also retained after LOAD is pressed.

If the chart size is changed by more than one-quarter inch, a load defaults to a complete reset.

NOTE

When installing or replacing media of any size, the chart *must* be aligned with the front loading groove before pressing the LOAD key. The plotter uses the position of the front loading groove as a reference to the front plot margin.

2.1.3 Resets

The DM/PL and HPGL resets for your plotter are explained in the following
paragraphs. When HPGL is active, a complete reset includes the initialize (IN) reset
and a partial reset includes a default (DF) reset.

- The plotter has two types of resets: complete reset and partial reset, which
  vary in extent. A partial reset typically occurs after loading a chart or as the
  result of a complete reset. A complete reset occurs at power on or as the result
  of operator action. Figure 2-2 shows how either form of reset can be initiated.
  For example, if you press the control panel RESET key during a plot, a complete
  reset and partial reset occur. If you press the LOAD key during a plot, only
  a partial reset occurs. Table 2-2 lists the values affected by a complete reset.
  The values affected by a partial reset are listed in Table 2-3.

- If HPGL is the active plotter language, an initialize reset (with a complete
  reset) or a default reset (with a partial reset) also occur. These are equivalent
  to the HPGL Initialize *IN* and Set Default Values *DF* commands, respectively.
  Tables 2-4 and 2-5 list the effects of the initialize reset and default reset. It
  is important to note that the HPGL Advance Half Page *AH* and Advance
  Full Page *AF* or *PG* commands **DO NOT** perform a reset.

  In addition, there are several plotter menu items that are not affected by any
  reset. These are listed in Table 2-6 and are immediately activated when selected.

CAUTION

If you manually reset the plotter by temporarily powering it off, be
sure to wait at least five seconds before powering it back on.
Otherwise, the plotter may not respond to the control panel keys.

NOTE

In these tables, the term *fixed* means that the condition always
assumes the indicated value. The term *menu value* means that the
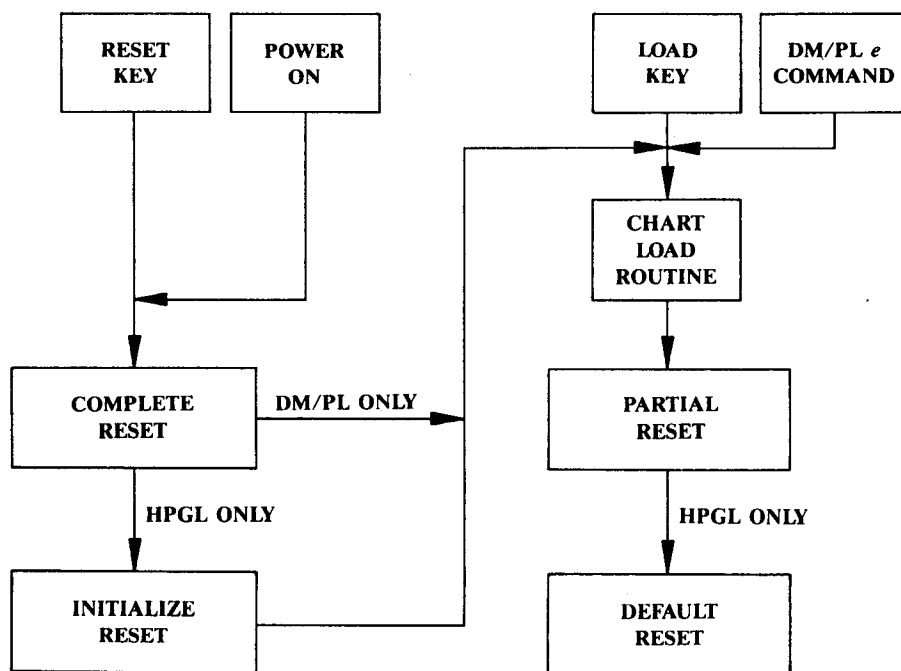condition always assumes the value presently set in the menu.

RESET
KEY

POWER
ON

LOAD
KEY

DM/PL *e*
COMMAND

CHART
LOAD
ROUTINE

COMPLETE
RESET

DM/PL ONLY

PARTIAL
RESET

HPGL ONLY

HPGL ONLY

INITIALIZE
RESET

DEFAULT
RESET

FIGURE 2-2. COMPLETE AND PARTIAL RESETS

TABLE 2-2. COMPLETE RESET PARAMETERS

CONDITION	TYPE
Baud rate	menu value
Clear plot data buffer (all data lost)	fixed
Clip window (reset)	set to actual chart size
DM/PL End of text character = __	fixed
DM/PL plotter deselected	fixed
DM/PL Prompt enable character = ^	fixed
Full chart length	set to actual chart size
Half chart length	set to actual chart size
Home and plot origin (reset)	menu value
HPGL plotter selected or deselected	menu value
HPGL set to data buffer ready status	fixed
HPGL XOFF character undefined	fixed
HPGL XON character undefined	fixed
Maximum window (reset)	set to actual chart size
Parity	menu value
Plotter Language	menu value
RTS/DTR mode	menu value
Send XON	fixed
Number of pens	menu value
Window & Viewport	set to actual chart size
Constant velocity	menu value

NOTES:

1. If HPGL is active, an initialize reset is also performed. See Table 2-4.

2. A partial reset is also performed. See Table 2-3.

3. The plotter goes to remote mode after a complete reset if a chart is loaded. If a chart is not loaded, the plotter will display its out of media code on the control panel LEDs after a complete reset. (The out of media LED code is explained in Appendix A.)

TABLE 2-3. PARTIAL RESET PARAMETER

CONDITION	TYPE
Chart size & orientation	set to actual chart size
DM/PL Addressable resolution	menu value
DM/PL Character set	menu value
DM/PL Character text font	menu value
DM/PL Extended marker size = 8	fixed
DM/PL Extended Text height = 8	fixed
DM/PL Extended Text italic off	fixed
DM/PL Extended Text spacing P or V (script)	fixed
DM/PL Extended Text width = 8	fixed
DM/PL Line type = 0 (solid line)	fixed
DM/PL Mode 2 response string = <CR>	fixed
DM/PL polygon fill parameter set to default	fixed
DM/PL relative/absolute addressing cleared	fixed
DM/PL Text direction horizontal	fixed
DM/PL Text fill density = 15	fixed
DM/PL Text fillable fonts	menu value
DM/PL Text intercharacter extra spacing = 0	fixed
DM/PL Text interline extra spacing = 0	fixed
DM/PL Text path horizontal	fixed
Home and plot origin (activated)	menu value
HPGL plot data buffer cleared (data lost)	fixed
HPGL plotter selected or deselected	menu value
Maximum window (activated)	set to actual chart size

TABLE 2-3. PARTIAL RESET PARAMETERS (Continued)

CONDITION	TYPE
Pen down acceleration	menu value
Pen down speed	menu value or last control panel entry
Pen up acceleration	menu value
Pen up speed	menu value
Constant velocity	menu value or last control panel entry
Number of pens	menu value
Window & Viewport	set to actual chart size or last control panel entry

NOTES:

1.   If HPGL is active, a default reset is also performed. See Table 2-5.

2.   The plotter goes to remote mode after a complete reset if a chart is loaded. If a chart is not loaded, the plotter will display its out of media code on the control panel LEDs after a complete reset. (The out of media LED code is explained in Appendix A.)

3.   If the chart size is changed by more than 0.25 inch (6.3 mm) in any dimension, the plotter executes a full reset.

TABLE 2-4. HPGL INITIALIZE RESET PARAMETERS

CONDITION	TYPE
90° rotation	menu value
Clears any error condition	fixed
(No downloadable character buffer)	fixed
Clears pen group definition	fixed
Default pen speed, force, acceleration set	fixed
Pen raised	fixed
Sets P1/P2 & axis origin to chart size	fixed
Sets Status Word Bit 3 to 1	fixed

TABLE 2-5. HPGL DEFAULT RESET PARAMETERS

CONDITION	TYPE
Alternate character set = 0	fixed
Character chord = HI smooth curve routine	fixed
Character selection mode = always seven-bit	fixed
Character slant = 0°	fixed
Chord tolerance = 5° for arcs & circles	fixed
Clear label buffer	fixed
Digitize mode cleared	fixed
Extra space = none	fixed
Fill angle = 0°	fixed
Fill spacing = 1% of P1/P2 distance	fixed
Fill type = 1 (solid)	fixed
Input window set to hard clip limits	fixed
Label origin = standard labeling	fixed
Label terminator = ETX	fixed
Lift & store unused pen after auto-cap delay	menu value
Line pattern length = 4% of P1/P2 distance	fixed
Line type = 1 (solid)	fixed
Plotting mode = absolute	fixed
Polygon buffer cleared	fixed
Relative direction = horizontal	fixed
Relative size character height = 0.375 cm	fixed
Relative size character width = 0.285 cm	fixed
Select character set = standard set	fixed
Standard character set = 0	fixed
Symbol mode off	fixed
Tick length of x-axis tick = 0.5% of P2y-P1y	fixed
Tick length of y-axis tick = 0.5% of P2x-P1x	fixed
User-defined fill = solid bidirectional	fixed

TABLE 2-6. NON-RESET ITEMS

CONDITION	TYPE
Auto-cap delay	menu value
Constant velocity	menu value or last control panel entry
Pass thru port	menu value
Number of pens	menu value

2.1.4   The Local and Enter Keys

The LOCAL and ENTER keys enable you to place the plotter into remote, local, menu, or window mode. Each operating mode causes the control panel keys to have different functions. The operating modes and key functions are explained in the following paragraphs.

2.2   REMOTE MODE

Remote mode enables your computer to communicate with the plotter and allows the software to control all plotting activity. Remote mode is active when only the LOAD key indicator is illuminated.

Remote mode is automatically activated after plotting media is installed and the RESET key or the LOAD key is pressed.

In remote mode, a DM/PL Mode One or Mode Two Plotter Select command or the HPGL select sequence establishes the communication link between the two devices. After the plotter is selected, it will continue to operate under computer control until you either deselect, reset, exit remote mode, change chart sizes, or power down the plotter.

Remote mode disables the manual use of all but the top row of the control panel functions until the RESET, LOAD, LOCAL and/or ENTER keys are used to specify a different operating mode.

2.3   LOCAL MODE

Local mode enables you to operate the plotter using the control panel keys. Local mode is initiated by first placing the plotter in remote mode (RESET, LOCAL, and ENTER indicators are off) and then pressing LOCAL. (The LOCAL indicator will illuminate.) To exit the plotter from local mode and return it to remote mode, press LOCAL. (The LOCAL indicator will turn off.)

NOTE

When the plotter is placed in local mode, the manual movement keys can be used to move the pen. When the plotter is returned to remote mode, the present position of the pen is defined as the new home position (x-,y-coordinate 0,0). This enables you to move the origin to any point on the media and produce plots over different areas of the same chart. After a plot completes, the pen returns to the present origin. You can then place the plotter in local mode again and use the manual movement keys to move the origin to a different point on the media. To return the pen to the normal left or right plot origin, you can either place the plotter in local and use the manual movement keys to move the pen to that point or you can reset the plotter.

2.3.1   Local Operation

When the plotter is placed in local mode, plotting activity can be manually controlled from the control panel keys. Manual operation of the plotter is explained below.

▲   When this key is pressed and held, the chart drives toward the rear of the plotter. To stop the chart drive, release the key.

▼   When this key is pressed and held, the chart drives toward the front of the plotter. To stop the chart drive, release the key.

▶   When this key is pressed and held, the pen drives along the pen bar to the right. The pen will stop at the right pinch roller assembly or when the key is released.

When this key is pressed and held, the pen drives along the pen bar to the left. The pen will stop at the left pinch roller assembly or when the key is released.

The pen holder moves to the present lower left corner of the window if this key is pressed and released (see Paragraph 2.8.1).

The pen holder moves to the present upper right corner of the window if this key is pressed and released.

The pen holder moves to the present lower left corner of the scale box if this key is pressed and released (see Paragraph 2.8.1).

The pen holder moves to the present upper right corner of the scale box if this key is pressed and released.

The pen holder's up/down status changes when the LOCAL key is pressed and held, and then the ENTER key is pressed.
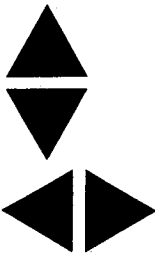
If these two keys are pressed simultaneously, the plotter performs the customer confidence test routine (see Paragraph 2.3.2).

If these two keys are pressed simultaneously, the plotter draws the Europlot design (see Paragraph 2.3.2) or replots the data in the extended buffer accessory if it is installed and enabled in the menu and if it contains a plot file (see Paragraph 1.11).

2.3.2   Customer Confidence Test

The customer confidence test plot (see Figure 2-3) displays several features and specifications of the DMP-60 series plotters.

To initiate the customer confidence test at the control panel, place the plotter in local mode, and then press the ▲ and the ▼ keys simultaneously. The procedure for initiating the routine from your computer is explained in the DM/PL manual.

FIGURE 2-3. THE CUSTOMER CONFIDENCE TEST PLOT DESIGN
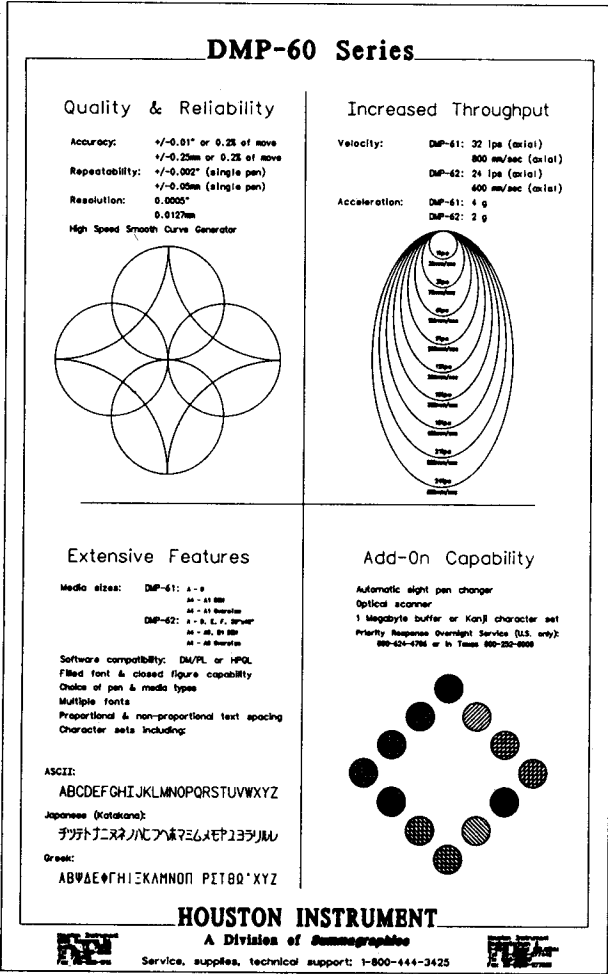
A Europlot design is also available (see Figure 2-4). Europlot can be initiated by first pressing LOCAL, and then pressing the ◄ and ► keys simultaneously. If the plotter has the extended buffer board accessory installed and enabled in the menu and it contains a plot file, the plotter must first be reset before initiating the Europlot design. Otherwise, the plotter will process the extended buffer contents.

The Europlot design enables you to verify the quality and performance of your plotter. Draw the Europlot on the different recommended pen type and media combinations and at different menu velocities and accelerations. This allows you to experiment with the different pen types and media and helps you determine which are best suited for your particular plotting applications. The recommended pen type and media combinations are listed in Paragraphs 1.2 and 1.2.1, and in *The Perfect Plot!* (part number MI-1098), which is supplied with your plotter.

Europlot should be plotted on chart size A4 or larger. Otherwise, its border will be clipped.

NOTE
The velocity and acceleration values shown in Figure 2-4 reflect the present menu selections. If a temporary control panel velocity is entered and in effect during the Europlot, then that value will be plotted instead of the present menu selection (see Paragraph 2.7). These values and the plot time vary if the menu selections are changed or if different temporary control panel velocities are entered.
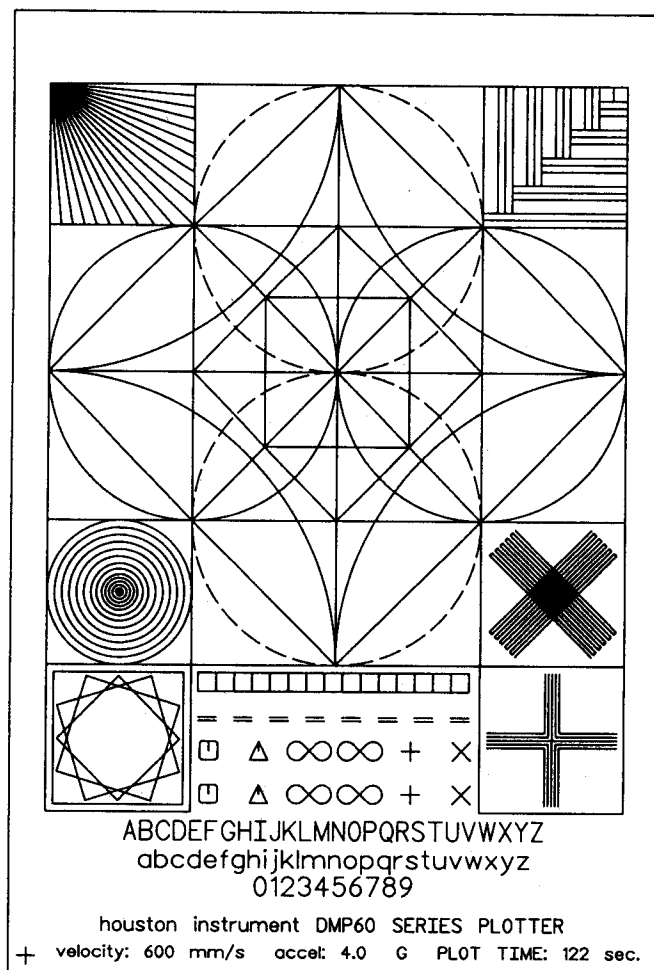
FIGURE 2-4. THE EUROPLOT DESIGN

2.4   SELECTING DM/PL OR HPGL PLOTTING LANGUAGE

The plotter can operate with either DM/PL or HPGL as the active plotting language. DM/PL or HPGL is selected by entering and exiting the respective menu.

It is important to note that the plotting language active in the plotter **MUST** match that of the plotting software you are using. That is, you must enable the desired plotting language in the plotter and select the appropriate plotter type with your plotting software. To use DM/PL, for example, select DM/PL as the active plotting language in the plotter, then select a Houston Instrument DMP-60 (or DMP-50) plotter as the plotting device in your software. To use HPGL, for example, select HPGL as the active plotting language in the plotter, then select an HP 758X plotter as the plotting device in your software.

Paragraph 2.5 explains how to enter and operate the plotter in DM/PL menu mode. To enter and operate the plotter in HPGL menu mode, refer to Paragraph 2.6.

NOTE
The DM/PL and HPGL menus have several identical parameters. However, these menus are independent and are separately maintained in the plotter. This means that changing a parameter in one menu **DOES NOT** change any corresponding parameter in the other menu. This is a feature to allow you to maintain separate configurations for DM/PL or HPGL use. For example, if you change the DM/PL menu *BAUD RATE* parameter, the *BAUD RATE* parameter in the HPGL menu is **NOT** changed.

NOTE
It is recommended that you use both the *list* and *help* menu items when configuring both menus and that you retain both menu plots with the plotter documentation for reference. Remember, the active plotter language (DM/PL or HPGL) is the one whose menu was most recently used. **DO NOT** press the RESET key to exit menu mode. Doing so may not correctly register a plotting language change. However, powering the plotter off and on while in a menu will correctly register a plotting language change, but will not install any changes made in the menu.

2.5   DM/PL MENU MODE

NOTE
DM/PL menu items **DO NOT** affect the HPGL menu items. When
you enter DM/PL menu mode, DM/PL becomes the active plotting
language. It is important to note that DM/PL **MUST** be the active
plotting language when using the Model 128A Scanner Accessory.

The DM/PL menu mode enables you to personalize the power-up operating
configuration of your plotter. For example, you can have your plotter ready to operate
at 2400 baud, even parity, 0.001 inch resolution, 24 inches per second pen velocities,
plot origin left, and ASCII character set active every time you power up the plotter.

An example of a DMP-61 DM/PL menu in English units is shown on the following
page.

DMPL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

1) UP-VELOCITY	1 2 4 6 8 10 12 14 16 18 20 22 24 28 [32] (ips)
2) UP-ACCELERATION	0.5 1.0 2.0 3.0 [4.0] (g)
3) UP-DELAY	25 [30] 35 40 45 50 55 60 65 70 75 80 (msec)
4) DOWN-VELOCITY	1 2 4 6 8 10 12 14 16 18 20 22 24 28 [32] (ips)
5) DOWN-ACCELERATION	0.5 1.0 2.0 3.0 [4.0] (g)
6) DOWN-DELAY	25 30 35 40 45 [50] 55 60 65 70 75 80 (msec)
7) PEN-CHANGE	[IGNORE] PAUSE
8) PLOT-ORIGIN	RIGHT LEFT [AUTO]
9) CONSTANT VELOCITY	OFF [ON]
10) ADDRESSING	.001in [.0051n] .025mm .100mm NORM
11) MENU UNITS	[ENGLISH] METRIC
12) TEXT FONT	[F0] F1 F2 F3 F4 F5 F6
13) CHARACTER SET	[G0] G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11
14) AUTO-PEN CAPPING	15 30 60 [120] 240 480 DISABLE (sec)
15) BAUD RATE	300 600 1200 2400 4800 [9600] (baud)
16) UART PARITY	[BIT 8-0] BIT 8-1 EVEN ODD
17) HANDSHAKE RTS/DTR	[TOGGLE] ALWAYS HIGH
18) PASS-THROUGH PORT	[TOGGLE] ALWAYS ON
19) OUTLINED FONTS	NOT FILLED [FILLED]
20) NUMBER OF PENS	[1] 2 3 4 5 6
21) ZERO CHARACTER	PLAIN [SLASH] DOTTED
22) COMM ERRORS	[IGNORED] REPORTED
23) OPTION BOARD	OFF [ON]
24) TEXT SPACING	[NON-PROPORTIONAL] PROPORTIONAL VARIABLE

PROCEDURE:

- move pen to desired menu option using the <— or —> arrow keys

- press ENTER key to display choices within selected option

- move pen to desired choice using the <— or —> arrow keys

- press ENTER key to record choice pointed to by pen

- press SCALE UR key to save parameters and exit menu

- hold SCALE LL key to abort plotting of list or help

MENU EXIT: parameters saved

The following paragraphs first provide an overview of the DM/PL menu and then explain how to operate the plotter in DM/PL menu mode.

In general, DM/PL menu mode works like this:

- To initiate DM/PL menu mode, first be sure the plotter is in remote mode, and then press the ENTER key and then the SCALE UR key.

- After DM/PL menu mode is initiated, the DM/PL menu parameters and options must be selected by first using the ◄ and ► keys to move the pen over the desired parameter or option, and then registered by pressing the ENTER key.

- If the plotter is instructed to plot the help list or the parameter list, the *plotting of the lists* can be aborted without exiting the plotter from DM/PL menu mode by pressing and holding the SCALE LL key.

- To exit DM/PL menu mode, press the SCALE UR key. (The plotter resets and installs all of the DM/PL menu values when the mode is exited.) Exit the plotter from DM/PL menu mode *before* changing charts for plotting activities.

2.5.1 Entering DM/PL Menu Mode

To enter DM/PL menu mode, install a pen into the pen holder, load a B-size (or DIN A3) chart or larger, and then press the LOAD key.

Press the ENTER key and then press the SCALE UR key to activate DM/PL menu mode. The plotter will then list the DM/PL menu option select line and park the pen over the *help* option.

2.5.2   The DM/PL Menu Option Select Line

After DM/PL menu mode is initiated, the DM/PL menu option select line is plotted.

DMPL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

The DM/PL menu option select line allows you to select either an individual DM/PL menu parameter by using the numeric designators or to plot the menu parameter *list* or the menu *help* option. To select a designator, or the parameter *list* or *help* option, use the ◄ and ► keys to move the pen over the desired function. After the pen is positioned, select the function by pressing the ENTER key.

2.5.3   The DM/PL Menu Help Option

The pen automatically parks over the *help* option after DM/PL menu mode is initiated. If *help* is selected by pressing the ENTER key, the plotter will list the following information.

DM/PL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

1) UP-VELOCITY
2) UP-ACCELERATION
3) UP-DELAY
4) DOWN-VELOCITY
5) DOWN-ACCELERATION
6) DOWN-DELAY
7) PEN-CHANGE
8) PLOT-ORIGIN
9) CONSTANT VELOCITY
10) ADDRESSING
11) MENU UNITS
12) TEXT FONT
13) CHARACTER SET
14) AUTO-PEN CAPPING
15) BAUD RATE
16) UART PARITY
17) HANDSHAKE RTS/DTR
18) PASS-THROUGH PORT
19) OUTLINED FONTS
20) NUMBER OF PENS
21) ZERO CHARACTER
22) COMM ERRORS
23) OPTION BOARD
24) TEXT SPACING
PROCEDURE:
- move pen to desired menu option using the <-- or --> arrow keys
- press ENTER key to display choices within selected option
- move pen to desired choice using the <-- or --> arrow keys
- press ENTER key to record choice pointed to by pen
- press SCALE UR key to save parameters and exit menu
- hold SCALE LL key to abort plotting of list or help

The *help* option lists the names of the parameters and menu instructions, and then returns the pen to the DM/PL menu option select line. If the ◄ and ► keys are now used to select a numeric parameter designator, the pen will move to the list of DM/PL menu parameter names and plot the options of the selected parameter. After the parameter options are plotted, the pen will park over the present setting.

To change a setting, use the ◄ and ► keys to move the pen to a new setting, and then press the ENTER key. The pen will then underline the new selection and return to the DM/PL menu option select line where this process can be repeated for other parameters. After the desired parameters have been changed, press the SCALE UR key, and the plotter will then draw a box around the new settings, save the options, exit DM/PL menu mode, reset the plotter, and enable the DM/PL plotting language.

To abort the plotting of the DM/PL menu help list and return the pen to the DM/PL menu option select line, press and hold the SCALE LL key. Release the SCALE LL key after the pen finishes plotting the present string and returns to the DM/PL menu option select line.

2.5.4   The DM/PL Menu Parameter List Option

If the ◄ and ► keys are used to move the pen over the *list* option and then ENTER is pressed, the plotter will list the following information.

DMPL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

1) UP-VELOCITY	1 2 4 6 8 10 12 14 16 18 20 22 24 26 32 (ips)
2) UP-ACCELERATION	0.5 1.0 2.0 3.0 4.0 (g)
3) UP-DELAY	25 30 35 40 45 50 55 60 65 70 75 80 (msec)
4) DOWN-VELOCITY	1 2 4 6 8 10 12 14 16 18 20 22 24 26 32 (ips)
5) DOWN-ACCELERATION	0.5 1.0 2.0 3.0 4.0 (g)
6) DOWN-DELAY	25 30 35 40 45 50 55 60 65 70 75 80 (msec)
7) PEN-CHANGE	IGNORE PAUSE
8) PLOT-ORIGIN	RIGHT LEFT AUTO
9) CONSTANT VELOCITY	OFF ON
10) ADDRESSING	.001in .005in .025mm .100mm NORM
11) MENU UNITS	ENGLISH METRIC
12) TEXT FONT	F0 F1 F2 F3 F4 F5 F6
13) CHARACTER SET	G0 G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11
14) AUTO-PEN CAPPING	15 30 60 120 240 480 DISABLE (sec)
15) BAUD RATE	300 600 1200 2400 4800 9600 (baud)
16) UART PARITY	BIT 0-0 BIT 0-1 EVEN ODD
17) HANDSHAKE RTS/DTR	TOGGLE ALWAYS HIGH
18) PASS-THROUGH PORT	TOGGLE ALWAYS ON
19) OUTLINED FONTS	NOT FILLED FILLED
20) NUMBER OF PENS	1 2 3 4 5 6
21) ZERO CHARACTER	PLAIN SLASH DOTTED
22) COMM ERRORS	IGNORED REPORTED
23) OPTION BOARD	OFF ON
24) TEXT SPACING	NON-PROPORTIONAL PROPORTIONAL VARIABLE

The *list* option causes the plotter to list the parameter names and options, underline their present settings, and return the pen to the DM/PL menu option select line. The ◄ and ► keys can then be used to move the pen over a numeric parameter designator if you desire a new parameter setting. If a parameter designator is specified, the pen will move to and park over the present setting on the list. After using the ◄ and ► keys to move the pen over a new setting, press the ENTER key and the pen will underline the new selection and return to the DM/PL menu option select line.

To abort the plotting of the DM/PL menu help list and return the pen to the DM/PL menu option select line, press and hold the SCALE LL key. Release the SCALE LL after the pen finishes plotting its present string and returns to the DM/PL menu option select line.

To exit DM/PL menu mode, press the SCALE UR key.

2.5.5   The Numeric DM/PL Menu Parameter Designators

After DM/PL menu mode is initiated and the DM/PL menu option select line is plotted, the ◄ and ► keys can be used to move the pen over a numeric parameter designator. After the pen is positioned, press ENTER and the plotter will list the name of the parameter and its options and park the pen over the present option setting.

To change an option setting, use the ◄ and ► keys to move the pen over a new setting, and then press ENTER. After ENTER is pressed, the pen will underline the selected option and return to the DM/PL menu option select line.

The DM/PL menu parameters and options are explained below. The DMP-61 and the DMP-62 have different operating capabilities which are explained in each situation where they differ.

1) UP-VELOCITY   *1 2 4 6 8 10 12 14 16 18 20 22 24 28*
                                  32 (ips)

          or

1) UP-VELOCITY   *30 50 100 150 200 250 300 350 400 450 500*
                                  550 600 700 800 (mm/s)

The *UP-VELOCITY* DM/PL menu parameter selects a velocity for a pen in the up position. If the English option is selected for DM/PL menu units (parameter 11), the velocity options are listed in inches per second. If the metric option is selected, the velocity options are listed in millimeters per second. Velocities of 28 ips (700 mm/s) and 32 ips (800 mm/s) are available only on the DMP-61.

2) UP-ACCELERATION   *0.5 1.0 2.0 3.0 4.0 (g)*

The *UP-ACCELERATION* DM/PL menu parameter is the rate of acceleration (in g) for a pen in the pen up position. Acceleration rates of 3.0 g and 4.0 g are available only on the DMP-61.

3) UP-DELAY   25   30   35   40   45   50   55   60   65   70   75   80 (msec)

The *UP-DELAY* is the time in milliseconds which the plotter will wait before executing the next pen up vector move. The delay is necessary to eliminate "tails" on vectors which could result from the pen moving before it is fully raised. For best quality plots on the DMP-61 or the DMP-62, set the pen up delay DM/PL menu parameter to 30 ms. (Shorter delay times may be selected but may result in a slight reduction in plot quality.)

4) DOWN-VELOCITY   1   2   4   6   8   10   12   14   16   18   20   22   24
*   28   32   (ips)*

     or

4) DOWN-VELOCITY   30   50   100   150   200   250   300   350   400   450
*   500   550   600   700   800   (mm/s)*

The *DOWN-VELOCITY* DM/PL menu parameter selects a velocity for a pen in the down position. If the English option is selected for DM/PL menu units (parameter 11), the velocity options are listed in inches per second. If the metric option is selected, the velocity options are listed in millimeters per second. Velocities of 28 ips (700 mm/s) and 32 ips (800 mm/s) are available only on the DMP-61.

5) DOWN-ACCELERATION   0.5   1.0   2.0   3.0   4.0   (g)

The *DOWN-ACCELERATION* DM/PL menu parameter is the rate of acceleration (in g) for a pen in the pen down position. Acceleration rates of 3.0 g and 4.0 g are available only on the DMP-61.

6) DOWN-DELAY   25   30   35   40   45   50   55   60   65   70   75   80 (msec)

The *DOWN-DELAY* is the time in milliseconds which the plotter will wait before executing the next pen down vector move. The delay is necessary to guarantee that the pen is fully down before a vector is drawn. For best quality plots on the DMP-61, set the pen down delay parameter to 50 ms. For best quality plots on the DMP-62, set the pen down delay parameter to 70 ms. (Shorter delay times may be selected but may result in a slight reduction in plot quality.)

7) PEN-CHANGE   IGNORE   PAUSE

The *PEN-CHANGE* DM/PL menu parameter activates the plotter's pen pause feature. The pen pause feature enables you to create multi-colored plots and graphs with your DM/PL software if the optional multi-pen changer accessory is not installed on your plotter. If this function is activated by selecting *PAUSE* and the plotter receives a DM/PL New Pen command, the plotter will pause and a flashing code will appear on the LEDs (see Appendix A) indicating that the plotter is ready for a manual pen change. After changing the pen, press LOCAL and the plotter will resume processing the program without loss of data. If *IGNORE* is specified, the plotter ignores New Pen commands. This parameter has no effect if the multi-pen changer accessory is installed on the plotter.

8) PLOT-ORIGIN   RIGHT   LEFT   AUTO

The *PLOT ORIGIN* DM/PL menu parameter moves the x-,y-origin point to either the front right (large chart) or the front left (small chart) corner of the chart. The x-,y-axis orientation is also rotated as shown in Figures 1-6 and 1-7. The *PLOT ORIGIN* parameter enables you to use one chart position for two different chart sizes. If the *AUTO* option is selected, the plotter automatically selects the plot origin for the standard x-,y-axis orientation for a chart.

9) CONSTANT VELOCITY   OFF   ON

If the *CONSTANT VELOCITY* DM/PL menu parameter is deactivated by selecting *OFF,* the plotter operates at its menu-selected velocity only on x-axis or y-axis movements. For diagonal moves there are both x-axis and y-axis velocities, giving a resultant velocity greater than either axis alone. For example, if 12 ips is selected on the menu for pen down velocity with this option deactivated and commands are given to draw a 45° diagonal line, the pen moves at a velocity of 17 ips ($\approx \sqrt{[12^2 + 12^2]}$ relative to a point on the chart.

If this parameter is activated by selecting *ON,* the pen will move at the selected velocity for any line angle. If this parameter is activated in the example above, the line will be drawn at a velocity of 12 ips relative to a point on the chart.

The plotter will generally yield more uniform line widths when this parameter is activated, but at a sacrifice in speed.

10) ADDRESSING   .001 in   .005 in   .025 mm   .100 mm   NORM

The *ADDRESSING* DM/PL menu parameter options select the plotter's resolution (in inches or millimeters). The present English or metric DM/PL menu unit selection (parameter 11) does not affect the resolution selection.

If the *NORM* option is selected, the plotter will automatically scale a plot to fit on the presently installed chart size if the plot code was written using EC0 units (see the DM/PL manual).

11) MENU UNITS   ENGLISH   METRIC

The *MENU UNITS* parameter enables you to configure the DM/PL menu in either English or metric units. If the *ENGLISH* option is specified, the pen velocity options are listed in inches. If the *METRIC* option is specified, the pen velocities are listed in millimeters.

12) TEXT FONT   F0   F1   F2   F3   F4   F5   F6

The *TEXT FONT* parameter selects the default DM/PL font style for the plotter to use. The DM/PL font styles are (F0) single stroke, (F1) serif, (F2) sans serif, (F3) serif bold, (F4) sans serif bold, (F5) ISO drafting, and (F6) script. The DM/PL font styles are illustrated in the DM/PL manual. These fonts may also be selected with the DM/PL Extended Text *S()* command.

13) CHARACTER SET   *G0 G1 G2 G3 G4 G5 G6 G7 G8 G9*
                               G10 G11

The *CHARACTER SET* parameter selects the default DM/PL character set for the plotter to use. The 12 DM/PL character sets are (G0) standard ASCII, (G1) mathematics, (G2) German, (G3) French, (G4) Swedish, (G5) Norwegian/Danish, (G6) Spanish, (G7) Italian, (G8) Katakana, (G9) Cyrillic, (G10) Greek, and (G11) Kanji. Character set G11 is available only if the Kanji option board is installed in the plotter. If the Kanji option board is not installed or the *OPTION BOARD* parameter is set to *OFF*, then character set G0 is used instead. The DM/PL character sets are illustrated in the DM/PL manual. These character sets may also be selected with the DM/PL Extended Text *S()* command.

14) AUTO-PEN CAPPING   *15 30 60 120 240 480 DISABLE (sec)*

The *AUTO-PEN CAPPING* feature is designed to prolong the lives of pens used on a plotter with the optional multi-pen changer accessory. This parameter specifies six different time limits (in seconds) for inactivity before the plotter beeps and automatically returns a pen in use to its stall. For example, if *120* is selected and the plotter is processing a program, it will beep and then automatically return a pen to its stall any time a 120 second break occurs in the processing. After a pen is returned, the pen holder parks in front of that stall and waits for additional plot codes. The plotter will not beep and automatically return a pen to its stall during periods of inactivity if *DISABLE* is specified. This parameter has no effect if the multi-pen changer is not installed on the plotter. (Only drafting pens are effectively capped when installed in the pen changer unit. Hard nib and roller ball pens should not be stored in the pen changer unit as explained in Section 1.8.1.)

15) BAUD RATE   *300 600 1200 2400 4800 9600 (baud)*

The *BAUD RATE* parameter enables you to select different operating baud rates for your plotter. Be sure this selection matches your computer and software selection.

16) UART PARITY   *BIT 8=0*   *BIT 8=1*   *EVEN*   *ODD*

The *UART PARITY* parameter selects the byte format and parity type. The *BIT 8=0* option specifies no parity, eight data bits, with bit eight equal to a zero. The *BIT 8=1* option specifies no parity, eight data bits, with bit number eight equal to a one. *EVEN* specifies seven data bits with even parity as the eighth bit, and *ODD* specifies seven data bits with odd parity as the eighth bit. Be sure this selection matches your computer and software selection.

17) HANDSHAKE RTS/DTR   *TOGGLE*   *ALWAYS HIGH*

The *HANDSHAKE RTS/DTR* parameter controls the plotter's RS-232-C connector pins 4 (RTS) and 20 (DTR). (The plotter's RS-232-C interface requirements are explained in Paragraph 1.9.) If your computer requires a constant high signal level at these two pins, select the *ALWAYS HIGH* option. If your computer uses these two pins for hardware handshaking, select the *TOGGLE* option.

18) PASS-THROUGH PORT   *TOGGLE*   *ALWAYS ON*

The *PASS-THROUGH PORT* parameter enables you to control the plotter's pass-through port option with your software. (The pass-through port feature is discussed in Paragraph 1.9.1). If *TOGGLE* is specified, the pass-through port is disabled when the plotter is selected, but can be turned on by sending a DM/PL Pass-Through Port Enable (X) command (see the DM/PL manual). The plotter can then be deselected and reselected to disable the port.

If *ALWAYS ON* is specified, the pass-through port is activated when the plotter is powered on and will remain active until the plotter is powered down.

19) OUTLINED FONTS   NOT FILLED   FILLED

The *OUTLINED FONTS* parameter selects the default fill for the DM/PL fillable text fonts (serif, sans serif, serif bold, and sans serif bold). If *NOT FILLED* is selected, then the default fill for these fonts is turned off, so that these are drawn as outlined characters. If *FILLED* is selected, then the default fill for these fonts is turned on, so that these are drawn as solid filled characters. For other fonts, this parameter setting has no effect. This parameter setting can be overridden with the DM/PL Extended Text *S()* command.

20) NUMBER OF PENS   1 2 3 4 5 6

The *NUMBER OF PENS* parameter specifies how many pens are installed in the plotter. If your plotter is a single-pen unit, this parameter has no effect. If your plotter is equipped with the pen changer accessory, use the parameter options to specify how many pens you are using in the pen changer.

21) ZERO CHARACTER   PLAIN   SLASH   DOTTED

The *ZERO CHARACTER* parameter enables you to select three different types of zero text characters. (The zero character types can only be selected in the menu and not with the software.) If *PLAIN* is specified, zero characters are plotted without a center slash or dot. If the *SLASH* option is specified, zero characters are plotted with a center slash. The *DOTTED* option produces zero characters that have a center dot. Note that this parameter setting is ignored for character sets G8 and G11.

22) COMM ERRORS   IGNORED   REPORTED

The *COMM ERRORS* parameter enables the plotter to use its control panel LEDs to report communication errors. The LED codes are explained in Appendix A. This parameter is usually activated by selecting *REPORTED* only when attempting to debug a communication link between the plotter and a host computer. After a link is established, this parameter can be disabled by selecting *IGNORED*. If the communication error routine is used, be sure the computer program does not use automatic baud rate selection (auto-baud). Otherwise, auto-baud will trigger baud rate error codes as it attempts to match baud rates.

23) OPTION BOARD   *OFF*   *ON*

If an option board is installed in the plotter, the *OPTION BOARD* parameter sets the function of that board on or off. This parameter **MUST** be set to *ON* for the plotter to recognize the presence of the option board. If no option board is installed, then this parameter has no effect.

24) TEXT SPACING   *NON-PROPORTIONAL*   *PROPORTIONAL*
                        VARIABLE

The *TEXT SPACING* parameter enables you to use the menu to select the type of spacing for DM/PL text characters. Note that this parameter setting is ignored for font F6 and character set G11. Script font (F6) defaults text spacing to variable and the optional Kanji character set (G11) defaults text spacing to non-proportional.

2.5.6   Exiting DM/PL Menu Mode

To exit DM/PL menu mode, press the SCALE UR key. As the plotter leaves DM/PL menu mode, it will draw a box around the selected options and then plot the message listed below.

MENU EXIT: *parameters saved*

If a system error prevents the parameters from being saved, the message listed below will appear and service is required (see Paragraph 5.3).

MENU EXIT: *parameters not saved*

NOTE
It is recommended that you keep a copy of the selected menu parameters with your plotter documentation. The menu parameters help our service personnel isolate suspected problems if you request technical assistance over the service toll-free phone numbers (see Paragraph 5.3).

2.6   HPGL MENU MODE

NOTE

HPGL menu items **DO NOT** affect the DM/PL menu items. When
you enter HPGL menu mode, HPGL becomes the active plotting
language. It is important to note that DM/PL **MUST** be the active
plotting language when using the Model 128A Scanner Accessory.

The following paragraphs first provide an overview of the HPGL menu and then
explain how to operate the plotter in HPGL menu mode.

In general, HPGL menu mode works like this:

●   To initiate HPGL menu mode, first be sure the plotter is in remote mode,
and then press the ENTER key and then the CLIP UR key. The plotter then plots
the top line of the menu.

●   After HPGL menu mode is initiated, the HPGL menu parameters and options
must be selected by first using the ◄ and ► keys to move the pen over the
desired parameter or option, and then registered by pressing the ENTER key.

●   If the plotter is instructed to plot the help list or the parameter list, plotting
of the lists can be aborted without exiting the plotter from HPGL menu mode
by pressing and holding the SCALE LL key.

●   To exit HPGL menu mode, press either the CLIP UR key or the SCALE UR. (The
plotter resets and installs all of the HPGL menu values when the mode is
exited.) Exit the plotter from HPGL menu mode **BEFORE** changing charts
for plotting activities.

●   After the plotter is exited from HPGL menu mode, HPGL becomes the active
plotting language.

An example of a DMP-61 HPGL menu is shown below.

HPGL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

1) UP-VELOCITY	30 50 100 150 200 250 300 350 400 450 500 550 600 700 [650] (mm/s)
2) UP-ACCELERATION	0.5 1.0 2.0 3.0 [4.0] (g)
3) UP-DELAY	25 [30] 35 40 45 50 55 60 65 70 75 80 (msec)
4) DOWN-VELOCITY	30 50 100 150 200 250 300 350 400 450 500 550 [600] 700 800 (mm/s)
5) DOWN-ACCELERATION	0.5 1.0 2.0 3.0 [4.0] (g)
6) DOWN-DELAY	25 30 35 40 45 50 55 60 65 [70] 75 80 (msec)
7) PEN-CHANGE	[IGNORE] PAUSE
8) PLOT-ORIGIN	[RIGHT] LEFT AUTO
9) CONSTANT VELOCITY	OFF [ON]
10) RESERVED	no parameters
11) RESERVED	no parameters
12) RESERVED	no parameters
13) RESERVED	no parameters
14) AUTO-PEN CAPPING	15 30 60 [120] 240 480 DISABLE (sec)
15) BAUD RATE	300 600 1200 2400 4800 [9600] (baud)
16) UART PARITY	[BIT 8=0] BIT 8=1 EVEN ODD
17) HANDSHAKE RTS/DTR	[TOGGLE] ALWAYS HIGH
18) LINE STATUS	[STANDALONE] EAVESDROP
19) RESERVED	no parameters
20) NUMBER OF PENS	[1] 2 3 4 5 6
21) ZERO CHARACTER	[PLAIN] SLASH DOTTED
22) RESERVED	no parameters
23) OPTION BOARD	OFF [ON]
24) RESERVED	no parameters

PROCEDURE:

- move pen to desired menu option using the <-- or --> arrow keys
- press ENTER key to display choices within selected option
- move pen to desired choice using the <-- or --> arrow keys
- press ENTER key to record choice pointed to by pen
- press SCALE UR key to save parameters and exit menu
- hold SCALE LL key to abort plotting of list or help

MENU EXIT: parameters saved

2.6.1   Entering HPGL Menu Mode

To enter HPGL menu mode, install a pen into the pen holder, load a B-size (or DIN A3) chart or larger, and then press the LOAD key.

Press the ENTER key and then press the CLIP UR key to activate HPGL menu mode. The plotter will then list the HPGL menu option select line and park the pen over the *help* option.

2.6.2   The HPGL Menu Option Select Line

After HPGL menu mode is initiated, the HPGL menu option select line is plotted.

HPGL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

The HPGL menu option select line allows you to select either an individual HPGL menu parameter by using the numeric designators or to plot the HPGL menu parameter *list* or the HPGL menu *help* option. To select a designator, or the parameter *list* or *help* option, use the ◄ and ► keys to move the pen over the desired function. After the pen is positioned, select the function by pressing the ENTER key.

2.6.3   The HPGL Menu Help Option

The pen automatically parks over the *help* option after HPGL menu mode is initiated. If *help* is selected by pressing the ENTER key, the plotter will list the following information.

HPGL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

1) UP-VELOCITY

2) UP-ACCELERATION

3) UP-DELAY

4) DOWN-VELOCITY

5) DOWN-ACCELERATION

6) DOWN-DELAY

7) PEN-CHANGE

8) PLOT-ORIGIN

9) CONSTANT VELOCITY

10) RESERVED

11) RESERVED

12) RESERVED

13) RESERVED

14) AUTO-PEN CAPPING

15) BAUD RATE

16) UART PARITY

17) HANDSHAKE RTS/DTR

18) LINE STATUS

19) RESERVED

20) NUMBER OF PENS

21) ZERO CHARACTER

22) RESERVED

23) OPTION BOARD

24) RESERVED

PROCEDURE:

- move pen to desired menu option using the <-- or --> arrow keys

- press ENTER key to display choices within selected option

- move pen to desired choice using the <-- or --> arrow keys

- press ENTER key to record choice pointed to by pen

- press SCALE UR key to save parameters and exit menu

- hold SCALE LL key to abort plotting of list or help

The *help* option lists the names of the parameters and HPGL menu instructions, and then returns the pen to the HPGL menu option select line. If the ◄ and ► keys are now used to select a numeric parameter designator, the pen will move to the list of HPGL menu parameter names and plot the options of the selected parameter. After the parameter options are plotted, the pen will park over the present setting.

To change a setting, use the ◄ and ► keys to move the pen to a new setting, and then press the ENTER key. The pen will then underline the new selection and return to the HPGL menu option select line where this process can be repeated for other parameters. After the desired parameters have been changed, press either the CLIP UR key or the SCALE UR key. The plotter will then draw a box around the new settings, save the options, exit HPGL menu mode, reset the plotter, and enable the HPGL plotting language.

To abort the plotting of the HPGL menu help list and return the pen to the HPGL menu option select line, press and hold the SCALE LL key. Release the SCALE LL key after the pen finishes plotting the present string and returns to the HPGL menu option select line.

2.6.4   The HPGL Parameter List Option

If the ◄ and ► keys are used to move the pen over the *list* option and then ENTER
is pressed, the plotter will list the following information.

HPGL OPTIONS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 list help

1) UP-VELOCITY	30 50 100 150 200 250 300 350 400 450 500 550 600 700 800 (mm/s)
2) UP-ACCELERATION	0.5 1.0 2.0 3.0 4.0 (g)
3) UP-DELAY	25 30 35 40 45 50 55 60 65 70 75 80 (msec)
4) DOWN-VELOCITY	30 50 100 150 200 250 300 350 400 450 500 550 600 700 800 (mm/s)
5) DOWN-ACCELERATION	0.5 1.0 2.0 3.0 4.0 (g)
6) DOWN-DELAY	25 30 35 40 45 50 55 60 65 70 75 80 (msec)
7) PEN-CHANGE	IGNORE PAUSE
8) PLOT-ORIGIN	RIGHT LEFT AUTO
9) CONSTANT VELOCITY	OFF ON
10) RESERVED	no parameters
11) RESERVED	no parameters
12) RESERVED	no parameters
13) RESERVED	no parameters
14) AUTO-PEN CAPPING	15 30 60 120 240 480 DISABLE (sec)
15) BAUD RATE	300 600 1200 2400 4800 9600 (baud)
16) UART PARITY	BIT 8=0 BIT 8=1 EVEN ODD
17) HANDSHAKE RTS/DTR	TOGGLE ALWAYS HIGH
18) LINE STATUS	STANDALONE EAVESDROP
19) RESERVED	no parameters
20) NUMBER OF PENS	1 2 3 4 5 6
21) ZERO CHARACTER	PLAIN SLASH DOTTED
22) RESERVED	no parameters
23) OPTION BOARD	OFF ON
24) RESERVED	no parameters

The *list* option causes the plotter to list the parameter names and options, underline their present settings, and return the pen to the HPGL menu option select line. The ◄ and ► keys can then be used to move the pen over a numeric parameter designator if you desire a new parameter setting. If a parameter designator is specified, the pen will move to and park over the present setting on the list. After using the ◄ and ► keys to move the pen over a new setting, press the ENTER key and the pen will underline the new selection and return to the HPGL menu option select line.

To abort the plotting of the HPGL menu help list and return the pen to the HPGL menu option select line, press and hold the SCALE LL key. Release the SCALE LL key after the pen finishes plotting its present string and returns to the HPGL menu option select line.

To exit HPGL menu mode and enter HPGL operating mode, press either the CLIP UR key or the SCALE UR key.

2.6.5   The Numeric HPGL Menu Parameter Designators

After HPGL menu mode is initiated and the HPGL menu option select line is plotted, the ◄ and ► keys can be used to move the pen over a numeric parameter designator. After the pen is positioned, press ENTER and the plotter will list the name of the parameter and its options and park the pen over the present option setting.

To change an option setting, use the ◄ and ► keys to move the pen over a new setting, and then press ENTER. After ENTER is pressed, the pen will underline the selected option and return to the HPGL menu option select line.

The HPGL menu parameters and options are explained below. The DMP-61 and the DMP-62 have different operating capabilities, which are explained in each situation where they differ.

1) UP-VELOCITY   *25   50   100   150   200   250   300   350   400   450*
                     500   550   600   700   800 (mm/s)

The *UP-VELOCITY* menu parameter selects a velocity for a pen in the up position. Velocities of 700 mm/s and 800 mm/s are available only on the DMP-61. These velocities are always listed in millimeters per second (mm/s) for HPGL.

2) UP-ACCELERATION   *0.5   1.0   2.0   3.0   4.0 (g)*

The *UP-ACCELERATION* menu parameter is the rate of acceleration (in g) for a pen in the pen up position. Acceleration rates of 3.0 g and 4.0 g are available only on the DMP-61.

3) UP-DELAY   *25   30   35   40   45   50   55   60   65   70   75   80 (msec)*

The *UP-DELAY* is the time in milliseconds which the plotter will wait before executing the next pen up vector move. The delay is necessary to eliminate "tails" on vectors which could result from the pen moving before it is fully raised.

For best quality plots on the DMP-61 and DMP-62, set the pen up delay menu parameter to 30 ms. (Shorter delay times can be selected, but may result in a slight reduction in plot quality.)

4) DOWN-VELOCITY   *25   50   100   150   200   250   300   350   400   450*
                       500   550   600   700   800 (mm/s)

The *DOWN-VELOCITY* menu parameter selects a velocity for a pen in the down position. Velocities of 700 mm/s and 800 mm/s are available only on the DMP-61. These velocities are always listed in millimeters per second (mm/s) for HPGL.

5) DOWN-ACCELERATION   *0.5   1.0   2.0   3.0   4.0 (g)*

The *DOWN-ACCELERATION* menu parameter is the rate of acceleration (in g) for a pen in the pen down position. Acceleration rates of 3.0 g and 4.0 g are available only on the DMP-61.

6) DOWN-DELAY   *25   30   35   40   45   50   55   60   65   70   75   80 (msec)*

The *DOWN-DELAY* is the time in milliseconds which the plotter will wait before executing the next pen down vector move. The delay is necessary to guarantee that the pen is fully down before a vector is drawn.

For best quality plots on the DMP-61, set the pen down delay menu parameter to 50 ms. For best quality plots on the DMP-62, set the pen down delay parameter to 70 ms. (Shorter delay times can be selected but may result in a slight reduction in plot quality.)

7) PEN-CHANGE   *IGNORE*   *PAUSE*

The *PEN-CHANGE* menu parameter activates the plotter's pen pause feature. The pen pause feature enables you to create multi-colored plots and graphs with your HPGL software if the optional pen changer accessory is not installed on your plotter. If this function is activated by selecting *PAUSE* and the plotter receives a HPGL Select Pen *SP* command, the plotter will pause and a flashing code will appear on the LEDs (see Appendix A) indicating that the plotter is ready for a manual pen change. After changing the pen, press LOCAL and the plotter will resume processing the program without loss of data. If *IGNORE* is specified, the plotter ignores Select Pen commands. This parameter has no effect if the pen changer accessory is installed on the plotter.

8) PLOT-ORIGIN   *RIGHT*   *LEFT*   *AUTO*

The *PLOT-ORIGIN* parameter enables you to use one chart position for two different chart sizes. The *RIGHT* option (full chart) places the plotter in HPGL rotate off (RO0). The *LEFT* option (half chart) places the plotter in HPGL rotate on (RO90). The HPGL x-,y-axis orientation is shown in Section 4, Figure 4-1. If the *AUTO* option is selected, the plotter automatically selects the plot origin for the chart.

9) CONSTANT VELOCITY   OFF   ON

If the *CONSTANT VELOCITY* menu parameter is deactivated by selecting *OFF*, the plotter operates at its menu-selected velocity only on x-axis or y-axis movements. For diagonal moves there are both x-axis and y-axis velocities, giving a resultant velocity greater than either axis alone. For example, if 300 mm/s is selected on the menu for pen down velocity with this option deactivated and commands are given to draw a 45° diagonal line, the pen moves at a velocity of 424 mm/s ($\approx \sqrt{[300^2 \times 2]}$) relative to a point on the chart.

If this parameter is activated by selecting *ON*, the pen will move at the selected velocity for any line angle. If this parameter is activated in the example above, the line will be drawn at a velocity of 300 mm/s relative to a point on the chart.

The plotter will generally yield more uniform line widths when this parameter is activated, but at a sacrifice in speed.

10) RESERVED

11) RESERVED

12) RESERVED

13) RESERVED

14) AUTO-PEN CAPPING   15   30   60   120   240   480   DISABLE (sec)

The *AUTO-PEN CAPPING* feature is designed to prolong the lives of pens used on a plotter with the optional pen changer accessory. This parameter specifies six different time limits (in seconds) for inactivity before the plotter beeps and automatically returns a pen to its stall. For example, if *120* is selected and the plotter is processing a program, it will beep and then automatically return a pen to its stall any time a 120 second break occurs in the processing. After a pen is returned, the pen holder parks in front of that stall and waits for additional plot codes. The plotter will not beep and automatically return a pen to its stall during periods of inactivity if *DISABLE* is specified. This parameter has no effect if the pen changer is not installed on the plotter. (Only drafting pens are effectively capped when installed in the pen changer unit. Hard nib and roller ball pens should not be stored in the pen changer unit as explained in Section 1.8.1.)

15) BAUD RATE   300   600   1200   2400   4800   9600 (baud)

The *BAUD RATE* parameter enables you to select different operating baud rates for your plotter. Be sure this selection matches your computer and software selection.

16) UART PARITY   BIT 8=0   BIT 8=1   EVEN   ODD

The *UART PARITY* parameter selects the byte format and parity type. The *BIT 8=0* option specifies no parity, eight data bits, with bit eight equal to a zero. The *BIT 8=1* option specifies no parity, eight data bits, with bit number eight equal to a one. The *EVEN* option specifies seven data bits with even parity as the eighth bit, and the *ODD* option specifies seven data bits with odd parity as the eighth bit. Be sure this selection matches your computer and software selection.

17) HANDSHAKE RTS/DTR   TOGGLE   ALWAYS HIGH

The *HANDSHAKE RTS/DTR* parameter controls the plotter's RS-232-C connector pins 4 (RTS) and 20 (DTR). (The plotter's RS-232-C interface requirements are explained in Paragraph 1.9.) If your computer requires a constant high signal level at these two pins, select the *ALWAYS HIGH* option. If your computer uses these two pins for hardware handshaking, select the *TOGGLE* option. (This parameter can be overridden by the HPGL Plotter Configuration *ESC.@* instruction.)

18) LINE STATUS   STANDALONE   EAVESDROP

The *LINE STATUS* parameter enables you to activate the plotter's HPGL eavesdrop mode by selecting the *EAVESDROP* menu option. Eavesdrop mode simulates the function of the STANDALONE/EAVESDROP switch on the HP model 7585B and 7586B plotters. This switch determines how the plotter is selected by the host computer.

This menu parameter setting should be selected according to your plotting software. The *STANDALONE* option means that the plotter is programmed-on at power up. The *EAVESDROP* option means that the plotter is in a programmed-off condition at power up and must be explicitly selected with a programmed-on command by the host computer. This menu setting becomes effective immediately when you exit menu mode.

19) RESERVED

20) NUMBER OF PENS   1 2 3 4 5 6

The *NUMBER OF PENS* parameter specifies how many pens are installed in the plotter. If your plotter is a single-pen unit, this parameter has no effect. If your plotter is equipped with the pen changer accessory, use the parameter options to specify how many pens you are using in the pen changer.

21) ZERO CHARACTER   PLAIN   SLASH   DOTTED

The *ZERO CHARACTER* parameter enables you to select three different types of zero text characters. (The zero character types can only be selected in the menu and not with the software.) If *PLAIN* is specified, zero characters are plotted without a center slash or dot. If the *SLASH* option is specified, zero characters are plotted with a center slash. The *DOTTED* option produces zero characters that have a center dot. Note that this parameter setting is ignored for character sets 5, 7, 8, 15, 17, 18, 25, 27, 28, and 101.

22) RESERVED

23) OPTION BOARD   OFF   ON

If an option board is installed in the plotter, the *OPTION BOARD* parameter sets the function of that board on or off. This parameter **MUST** be set to *ON* for the plotter to recognize the presence of the option board. If no option board is installed, then this parameter has no effect.

24) RESERVED

2.6.6   Exiting HPGL Menu Mode

To exit HPGL menu mode, press either the CLIP UR key or the SCALE UR key. As the plotter leaves HPGL menu mode, it will draw a box around the selected options and then plot the message listed below.

MENU EXIT: parameters saved

If a system error prevents the parameters from being saved, the message listed below will appear and service is required.

MENU EXIT: parameters not saved

NOTE
It is recommended that you keep a copy of the selected menu parameters with your plotter documentation. The menu parameters help our service personnel isolate suspected problems if you request technical assistance over the service toll-free telephone numbers listed in Paragraph 5.3.

2.7   TEMPORARY VELOCITY SETTINGS

The temporary velocity function enables you to change the pen down velocity and toggle the constant velocity option during plotting activities without having to access the menu.

If the plotter is operating in remote mode with the menu English units selected and the ENTER key is pressed, pen down velocities of 4, 8, and 16 inches per second can be specified by pressing ◄, ▲, and ►, respectively.

If the plotter is operating in remote mode with the menu metric units selected and the ENTER key is pressed, pen down velocities of 100, 200, and 400 millimeters per second can be specified by pressing ◄, ▲, and ►, respectively.

The ▼ key specifies maximum velocity for either English or metric units. To return to the menu-selected velocity, press the ENTER key, and then the CLIP LL key.

The constant velocity option can be toggled on and off by pressing the ENTER key, and then the SCALE LL key.

The temporary control entries are shown in Figure 2-5.
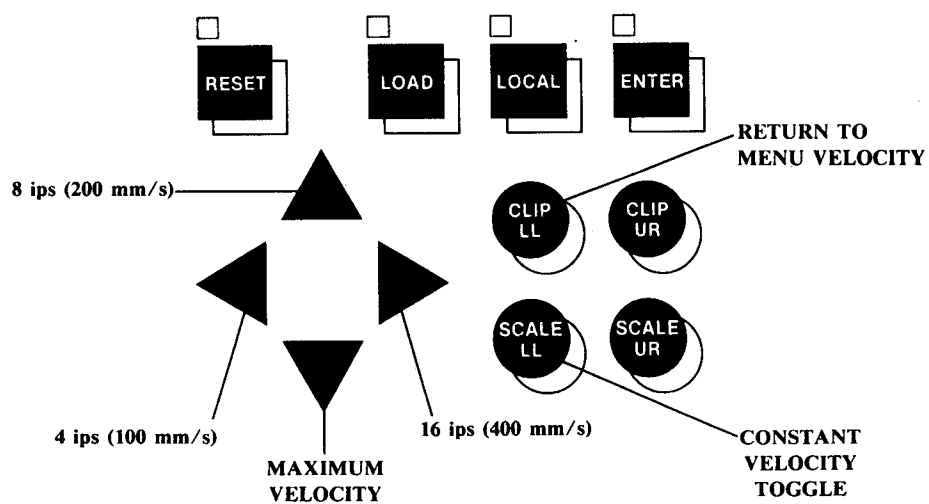
FIGURE 2-5. TEMPORARY CONTROL PANEL ENTRIES

The following procedure explains how to specify a temporary velocity setting on a plotter operating at a menu velocity or DM/PL V command velocity of, for example, 12 ips.

1.   During a plot program, you decide to try a complex plot design at a slower rate of velocity of 4 ips.

2.   Just before the plotter processes the portion of the program which contains the design, press the ENTER key. (The ENTER indicator will illuminate and the plotter will stop processing data.)

3.   Press the ◄ key for 4 ips (see Figure 2-5). After the key is pressed, the plotter automatically returns to remote mode and continues processing. (The plotter may have internally pre-processed one or two vector moves at the original velocity before the ENTER was pressed in step 2. If so, the plotter will plot those vectors at the original velocity before the 4 ips selection goes into effect.)

4.   After the plotter draws the design at 4 ips, press the ENTER key again. Plotting can be resumed at menu velocity (12 ips) by pressing the CLIP LL key (see Figure 2-5).

2.8   WINDOW MODE

Window mode enables you to specify different window and scale box limits. To place the plotter in this mode, you must first specify local mode (press and release the LOCAL key) and then specify window mode by pressing and releasing the ENTER key. (The LOCAL and ENTER indicators will illuminate.)

The plotter automatically returns to local mode after a new limit is specified. If an error was made when specifying a limit, the plotter will display the LED window error code condition (see Appendix A) as you attempt to return to remote mode from local mode, and operation of the plotter is inhibited. If this condition occurs, press LOCAL and specify the limits again.

After the limits have been correctly set, return the plotter to remote mode by pressing LOCAL. (The LOCAL and ENTER indicators are both off when the plotter is in remote mode.)

NOTE

Two sets of windows and viewports are maintained in the plotter. One set is the DM/PL Window (W) command and the other set is the control panel settings. They are mathematically combined by the plotter to allow any plot code to plot within an area specified at the control panel.

Effectively, the control panel clip and scale settings allow you to define the plotter's plotting surface. At power up, the default control panel settings allow a 1:1 mapping ratio of plot code to the chart size presently installed. By altering the control panel settings, you can locate, scale, window, and/or mirror your plot anywhere on the chart surface.

2.8.1   Window, Scale Box, and Viewport Functions

As you become more familiar with your plotter, and the complexity of your plots increases, you will discover many useful applications for the plotter's window and scaling capabilities. These functions enable you to select any subpart of a plot design, change its size and/or height-to-length (aspect) ratio if desired, and then plot it separately on the same chart or a different chart. This section first provides a functional overview of the window, scale box, and viewport features, and then explains how to use them. A mirror image of a plot is also possible by using the window functions. This is explained later in this section.

The Window...

The subpart of a plot design that is selected to be replotted is called a *window plot.* A window plot is created by specifying an imaginary rectangle around a subpart using two points, called the *lower left (LL) and the upper right (UR) window corner points* (see Figure 2-6). The lines of the imaginary rectangle are called *window limits.* Only the plot codes within the specified window limits are processed by the plotter when the program is rerun; thus, only the subpart (window plot) appears on the chart.
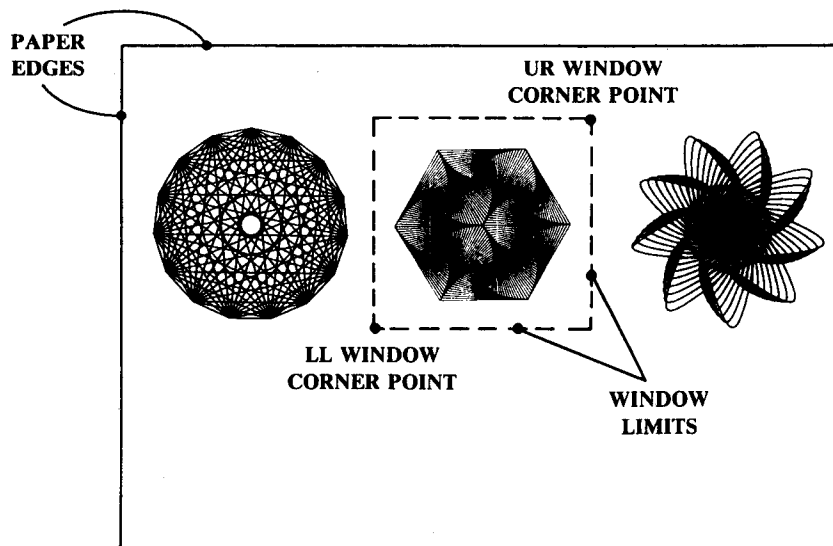
FIGURE 2-6. WINDOW LIMITS AROUND A SUBPART OF A PLOT DESIGN

The Scale Box...

If a subpart of a plot design is selected as a window plot and then the program is rerun, the subpart will be plotted at the same size as it appeared in the full plot design. However, if you want the subpart plotted at a larger or smaller size, or with a different height-to-width ratio (aspect) for a special visual effect, you can specify these changes with the *scale box* function before rerunning the program.

Like the window, the scale box is an imaginary rectangle which must be specified by two points called the *lower left (LL) and the upper right (UR) scale box corner points*. The lines of the imaginary rectangle are called *scale box limits*. If a scale box rectangle is specified after a window rectangle is placed around a subpart, the plotter will process the plot data defined by the window *at the size specified by the scale box rectangle*.

For example, if a scale box rectangle is specified the same length as the Figure 2-6 window, but three times the height, the subpart plot will appear stretched in the vertical direction when the program is rerun (see Figure 2-7). If the scale box rectangle is specified the same height as the window, but three times the length, the subpart plot will appear stretched in the horizontal direction (see Figure 2-8). If the scale box rectangle is specified three times the height and the length of the window rectangle, the subpart plot will appear three times as large (see Figure 2-9).

It is also possible to plot a design upside-down by reversing the lower left and the upper right corner points of the scale box.
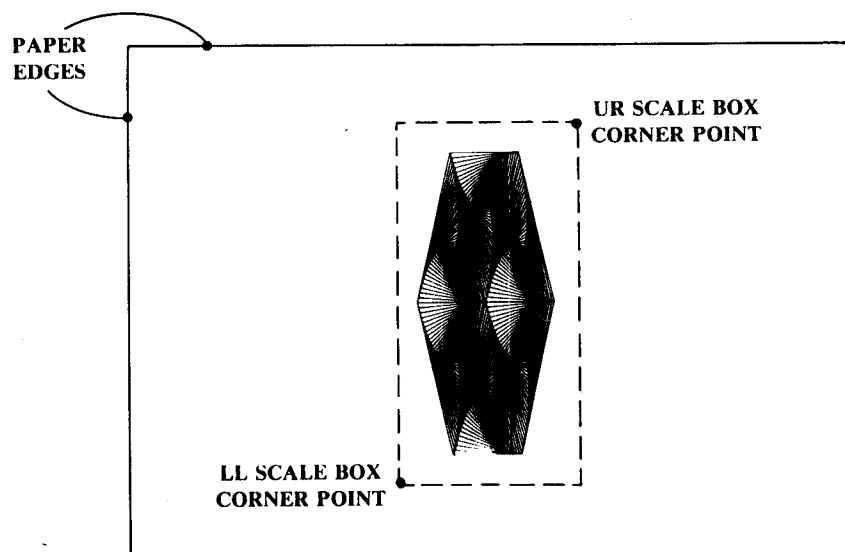
FIGURE 2-7. A SCALE BOX THREE TIMES THE HEIGHT OF THE WINDOW
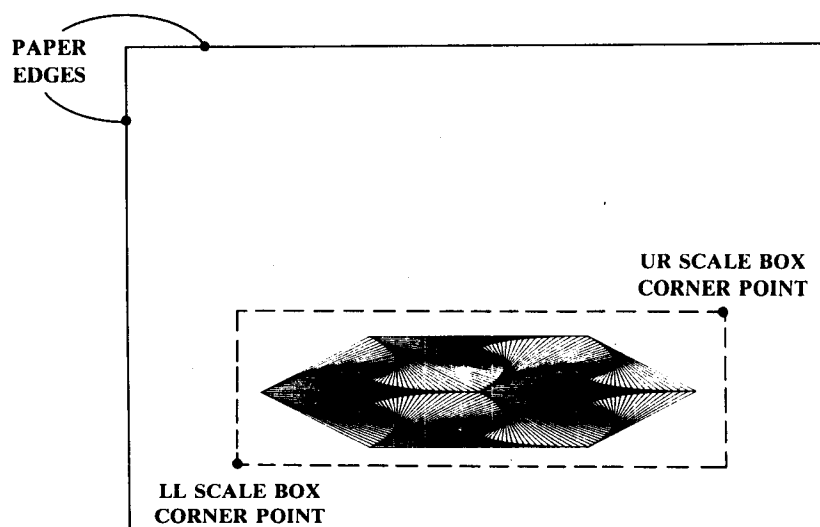
FIGURE 2-8. A SCALE BOX THREE TIMES THE LENGTH OF THE WINDOW
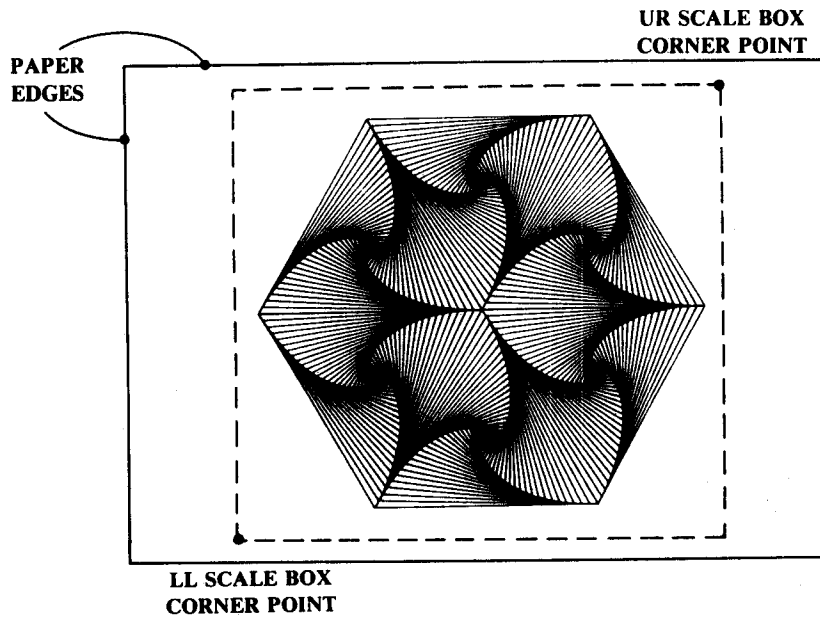
FIGURE 2-9.
A SCALE BOX THREE TIMES THE HEIGHT/LENGTH OF THE WINDOW

The Viewport...

Finally, you have to decide *where* on the chart to place the new subpart plot, or select a *viewport*. This is done by specifying where the lower left corner of the new plot is to be. Since the size and the shape for the new plot have already been determined by the scale box rectangle, picking a point where you want the lower left corner of the scale box area to appear will tell the plotter just where to draw the new plot.

The point that selects the viewport area is specified by the present position of the pen holder. By moving the pen holder to a point *below and to the left of which* you want the new plot of the subpart to appear, you determine the location for the new plot when the program is rerun.

Clipping...

In plotter terminology, the entire sequence of using the window, scale box, and viewport functions on a plot design is called *clipping,* and a plot design that results from clipping is called a *clip.*

When the plotter is commanded to draw a clip from a plot design or during the actual processing of the clip, the pen may pause for various lengths of time. The reason for the pause is that when window limits are specified, the plotter still receives the plot codes for the entire plot design but draws only the data for the plot that was placed inside the limits.

If the data for the window plot is not at the beginning of the program, the pen must wait until that portion of the program is received by the plotter. If the plotter is processing window data and receives plot codes that require the pen to travel outside the limits, the pen will process up to the limit and then pause. Plotting activity is resumed when the plotter receives additional data within the window.

The window and scale box limits default to the entire plotting area if the plotter is reset or powered down. The limits are not affected by using the LOAD key to install media.

To better explain how to set the limits for each function and then use them in sequence to clip a plot design, this manual provides actual clipping exercises in Paragraphs 2.8.2, 2.8.3, and 2.8.4.

These exercises do not require computer assistance since all activity is initiated from the plotter's control panel. The exercises use the customer confidence test plot design to illustrate the clipping procedures. Before proceeding with these exercises, be sure you have the plotter's power switch set to ON, a clean chart and a pen installed, and for convenience, the DM/PL menu *PLOT ORIGIN* parameter set to the *AUTO* option and the plotter in DM/PL operating mode.

2.8.2   Auto Clipping

The auto clipping function enables you to clip a subpart from a plot design with the window, and then reproduce it at its original size and aspect without having to scale it. This feature saves time in operations where scaling is not required. The following procedure explains how to specify new lower left (LL) and upper right (UR) corner points for the window for auto clipping.

1.   Press LOCAL for manual control of the plotter, and then initiate the customer confidence test routine by pressing the ▲ and ▼ keys simultaneously. After the plotter draws the customer confidence test design, press LOCAL to return the plotter to manual control.

2.   This step explains how to see where the present window limits are located. The pen holder moves to the present lower left corner of the window if CLIP LL is pressed. The pen moves to the present upper right corner of the window if CLIP UR is pressed.
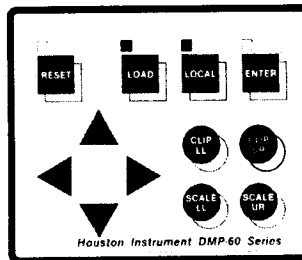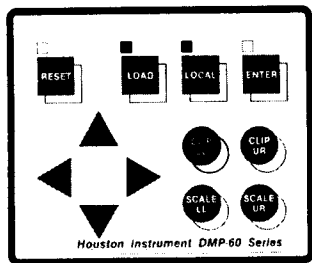
Return the pen holder to the lower left corner by pressing CLIP LL. Notice that the pen holder travels the outline of the window as it moves from corner to corner and that the present window limits enclose the entire plotting area.
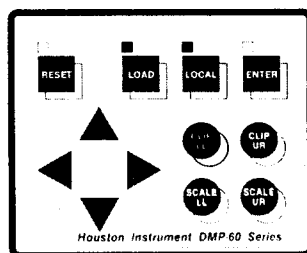
3.   The objective of this step is to clip the circle/arc design from the test plot with the window. Use the MANUAL MOVEMENT KEYS to move the pen holder to the position of the lower left window marker illustrated in Figure 2-10. After the pen holder is positioned, specify this location as the new lower left corner point of the window by pressing ENTER (the LED indicator will illuminate), and then CLIP LL. (After CLIP LL is pressed, the ENTER indicator will turn off.)
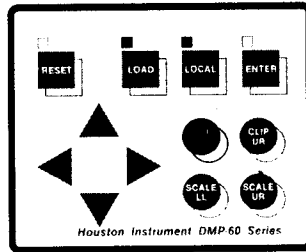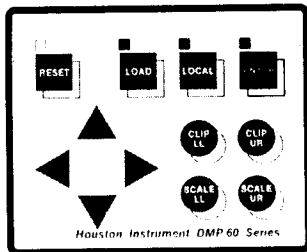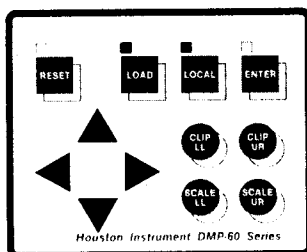
Next, use the MANUAL MOVEMENT KEYS to move the pen holder to the position of the upper right window marker illustrated in Figure 2-10. After the pen holder is positioned, specify this location as the new upper right corner point of the window by pressing ENTER (the LED indicator will illuminate), and then CLIP UR. (After CLIP UR is pressed, the ENTER indicator will turn off.) Register the corner points by pressing the LOCAL key (the LOCAL indicator will turn off).
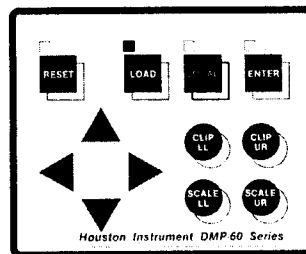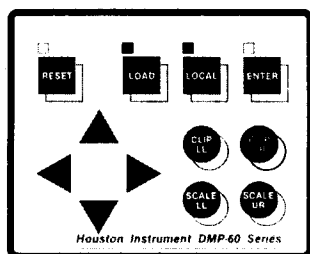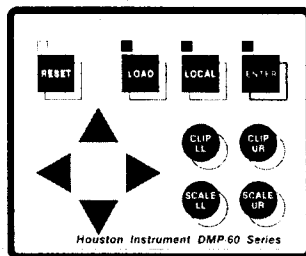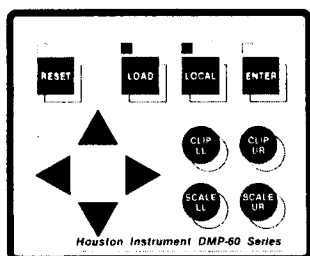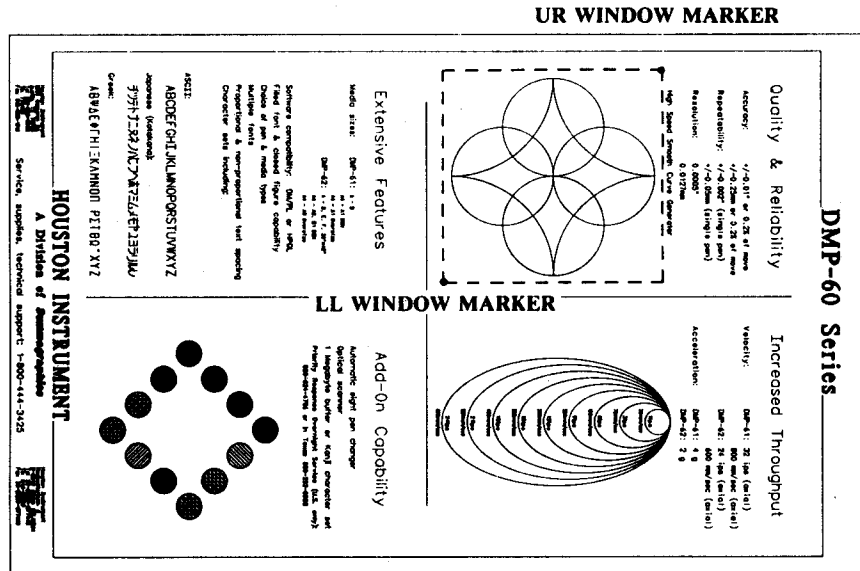
FIGURE 2-10. LOWER LEFT/UPPER RIGHT WINDOW MARKERS

4.   The new window corner points are now set. Press the LOCAL key for local mode. Jog the pen holder around the new window limits by pressing CLIP LL, then CLIP UR, and then CLIP LL again. The pen holder should travel the outline of the circle/arc design.

5.   In this step, you will reproduce the design that was clipped in step 3. *Do not* press RESET until after the plotter has drawn the clip design or the new window limits will default to full page.

Insert a clean chart of the same size at load position. (Load position is shown in Figures 1-6 and 1-7.) Press the LOAD key to properly load the new sheet. After the plotter positions the media, press the LOCAL key for local mode.

Use the MANUAL MOVEMENT KEYS to move the pen holder to the position of the viewport marker illustrated in Figure 2-11. (This is the point below and to the left of which the plotter draws the plot design.) After the pen is positioned, initiate the customer confidence test routine by pressing the ▲ and the ▼ keys simultaneously. (The plotter will pause before and during the customer confidence test plot. As explained in Paragraph 2.8.1, pen pause is normal when clipping plot designs.) The only design the plotter draws during this customer confidence test is the clipped circle/arc design.

**CLEAN
LARGE PAPER**
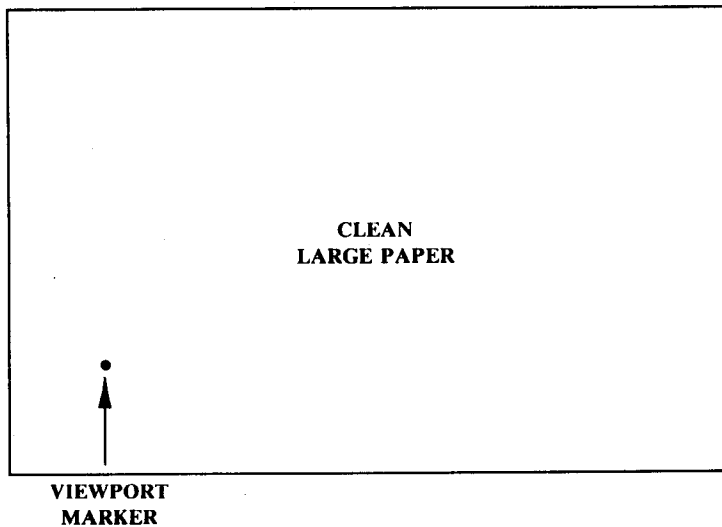
**VIEWPORT
MARKER**

**FIGURE 2-11. VIEWPORT MARKER**

2.8.3   Scaling

This section shows you how to change the size and aspect of a plot design using the scale box. The plot design used in the following procedure is the customer confidence test plot.

1.   Insert a clean sheet of large chart media in the plotter and position it at the load position.

2.   Press RESET. This causes the window limits that were set in the previous procedure to default to maximum page.

3.   Press LOCAL. Initiate the customer confidence test routine by pressing the ▲ and ▼ keys simultaneously.

4.   Because the plotter was reset in step 2, the plotter has maximum window limits. This means that the plotter will scale the entire page, which includes the customer confidence test plot design, to the dimensions of the scale box.

Just for fun, let's grossly exaggerate the aspect of the design with scale box limits so you'll see the full power and potential of this feature. Press LOCAL, and then use the MANUAL MOVEMENT KEYS to move the pen holder to the location specified by the lower left scale box marker shown in Figure 2-12. After the pen holder is positioned, specify this point as the lower left corner of the scale box by pressing ENTER and then SCALE LL. (The ENTER indicator will illuminate when ENTER is pressed and will turn off when SCALE LL is pressed.)
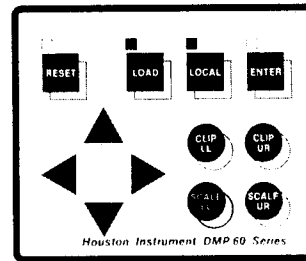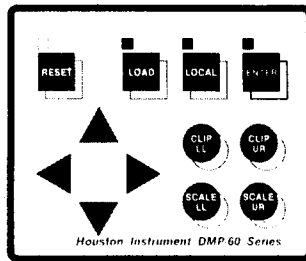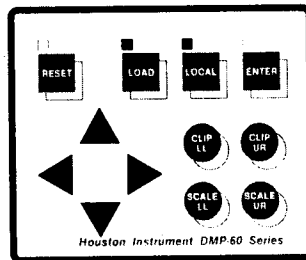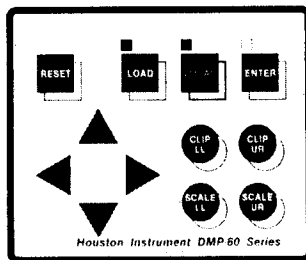
Next, use the MANUAL MOVEMENT KEYS to move the pen holder to the location specified by the upper right scale box marker shown in Figure 2-12. After the pen holder is positioned, specify this point as the upper right scale box corner by pressing ENTER and then SCALE UR. (Again, the ENTER indicator will illuminate when ENTER is pressed and will turn off when SCALE UR is pressed.) Register the corner points by pressing the LOCAL key (the LOCAL indicator will turn off).
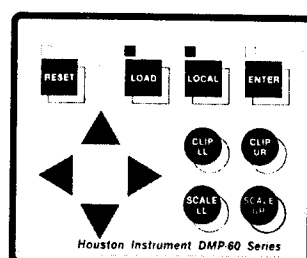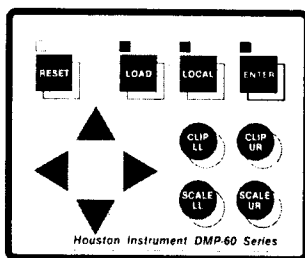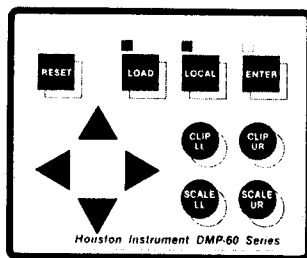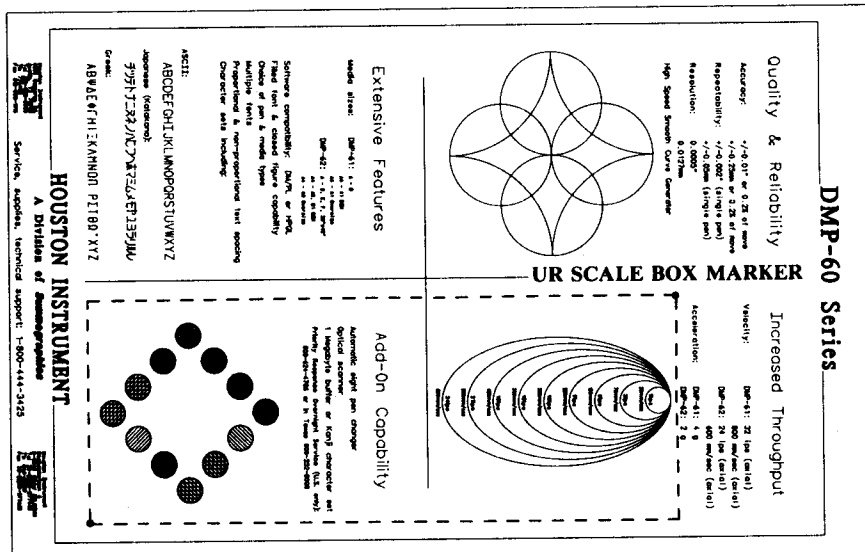
LL SCALE BOX MARKER

FIGURE 2-12. LOWER LEFT/UPPER RIGHT SCALE BOX MARKERS

5.   Remove the media and replace it with a clean sheet of the same size or use the back side of the used sheet. Load the media at the load position, and then press the LOAD key to properly install the media.

        Press the LOCAL key for local mode. Use the MANUAL MOVEMENT KEYS to move the pen holder to the location of the viewport marker shown in Figure 2-11. Initiate the customer confidence test routine by pressing the ▲ and the ▼ keys simultaneously. The resulting plot design will look similar to the illustration shown in Figure 2-13.

FIGURE 2-13. THE SCALED CUSTOMER CONFIDENCE TEST PLOT DESIGN

2.8.4   Auto Aspect

Your plotter has an internally-programmed "auto aspect" feature which ensures a common aspect ratio between an original plot design and its scaled version. This feature is useful during scaling operations that require criti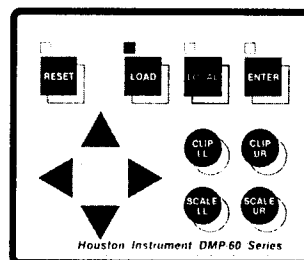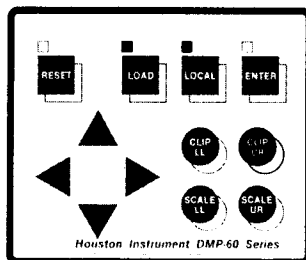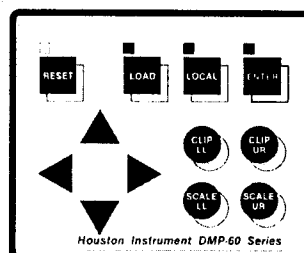cal aspect reproductions. The auto aspect feature eliminates possible aspect discrepancies which may occur if locations for new scale box corner points are simply estimated.

For your convenience, there are two ways to scale a plot design using the auto aspect function. But before explaining how to use this feature, the theory of auto aspect must be discussed first. If a lower left and an upper right corner point for a scale box are specified *on the same axis*, the plotter will automatically calculate the axis not specified and draw a perfectly proportioned, scaled reproduction of the original plot design. (The two points can be specified on either the x- or the y-axis.) The length of the line formed by the two points determines the size of the scaled design.

The following procedures explain how to scale plot designs using the auto scale function.

1. Insert a clean sheet of large chart media in the plotter and position it at the load position.

2. Press RESET. This causes the window and scale box limits that were set in the previous procedure to default to maximum page.

3. Press LOCAL for manual control of the plotter, and then initiate the customer confidence test routine by pressing ▲ and ▼ simultaneously. After the routine completes, press LOCAL again for manual control.

4. In this exercise, you will clip the diamond/circle design from the plot design with the window, and then use the auto aspect function to reproduce it at the original aspect but at a larger size. Use the MANUAL MOVEMENT KEYS to move the pen holder to the location indicated by the lower left window marker shown in the illustration in Figure 2-14. After the pen holder is positioned, specify this point as the new lower left corner of the window by pressing ENTER and then CLIP LL.
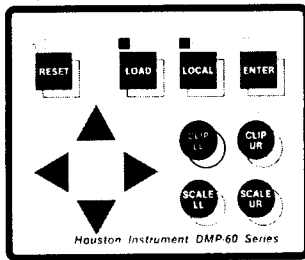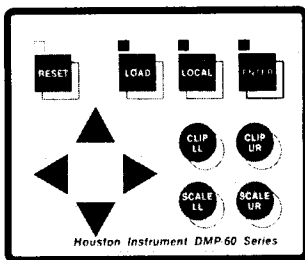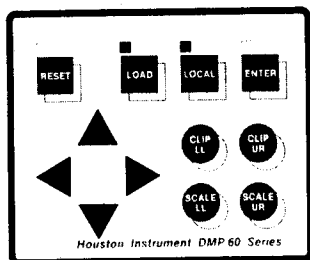
Next, use the MANUAL MOVEMENT KEYS to move the pen holder to the location indicated by the upper right window marker shown in the illustration in Figure 2-14. After the pen holder is positioned, specify this point as the new upper right corner of the window by pressing ENTER and then CLIP UR. Press the LOCAL key and the diamond/circle design is now clipped from the plot by the window.
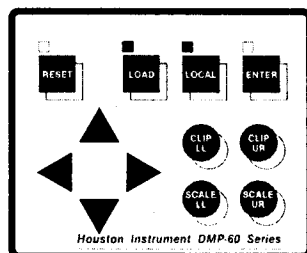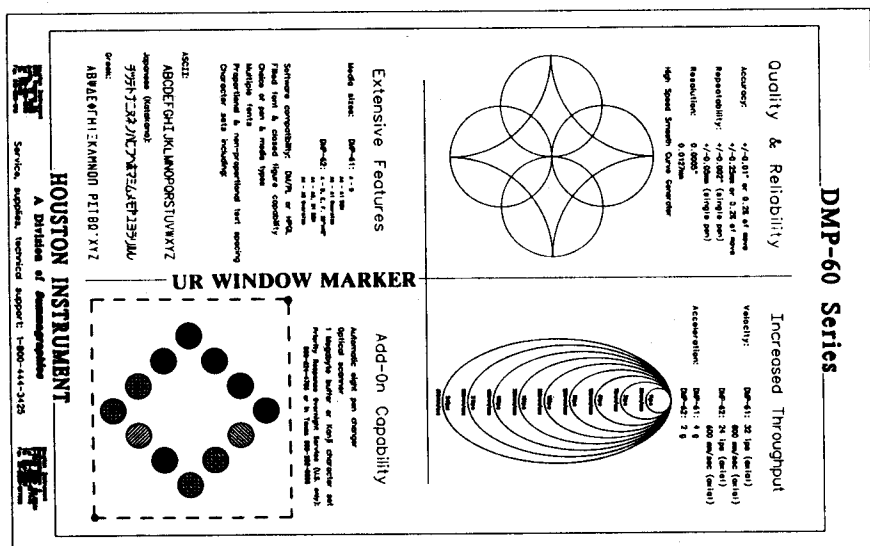
LL WINDOW MARKER

FIGURE 2-14. LOWER LEFT/UPPER RIGHT WINDOW MARKERS

5. Next, you will use the auto aspect feature to "show" the plotter what size you want the reproduction of the clipped diamond/circle design to be.

Press LOCAL for manual control, and use the MANUAL MOVEMENT KEYS to move the pen holder to the location indicated by the lower left scale box marker shown in the illustration in Figure 2-15. After the pen holder is positioned, specify its location as the new lower left scale box corner by pressing ENTER and then SCALE LL.
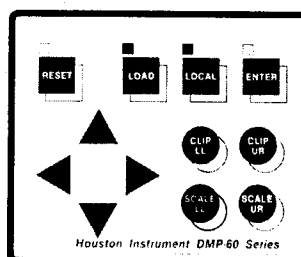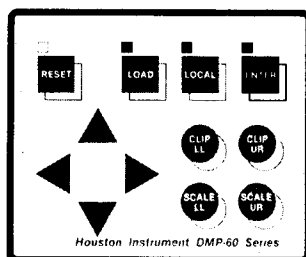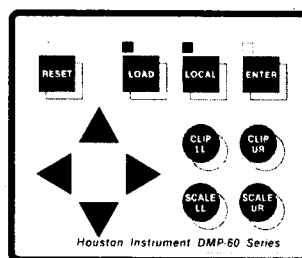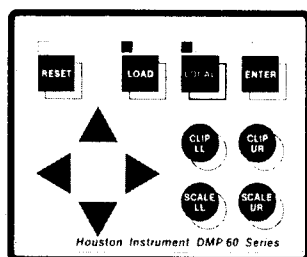
Next, if you have large chart format media installed, use only the ▼ key to drive the chart forward until the position of the upper right scale box marker shown in Figure 2-15 is underneath the pen. If you have small chart format media installed, use only the ► key to drive the pen holder to the upper right scale box marker. Specify this location as the new upper right scale box corner by pressing ENTER and then SCALE UR. Press the LOCAL key to register the scale box points. The distance between these two points specifies the length of the x-axis for the reproduction of the clipped design. The height of the y-axis, which in this case determines the design's aspect, is automatically calculated by the plotter.
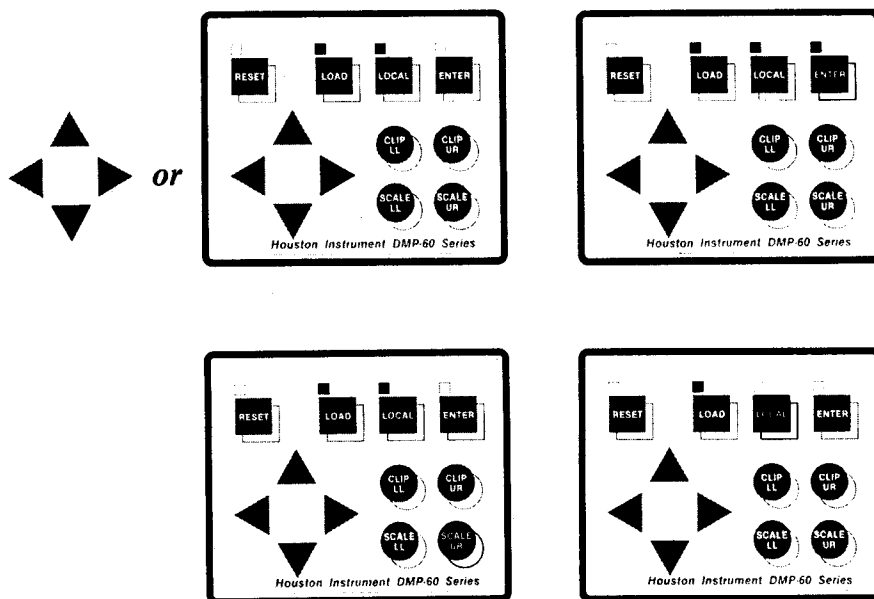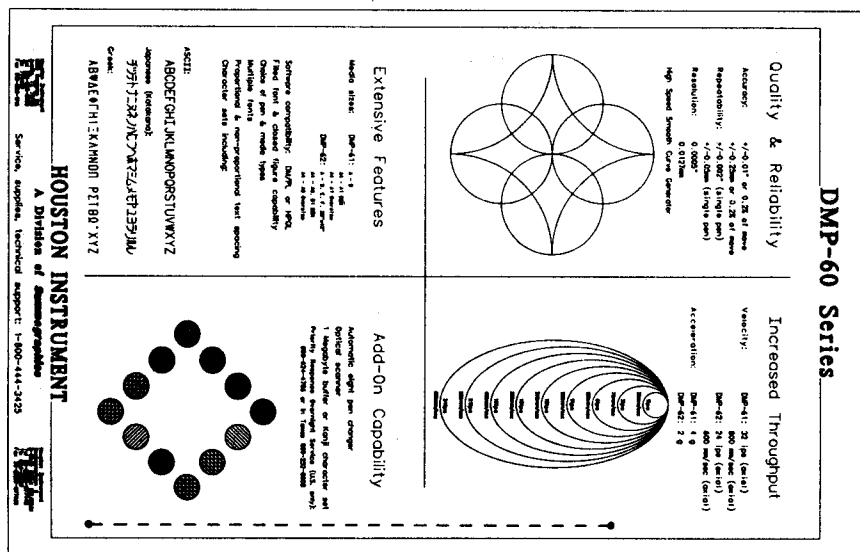
LL SCALE BOX MARKER   UR SCALE BOX MARKER

FIGURE 2-15.
LOWER LEFT/UPPER RIGHT SCALE BOX MARKERS FOR AUTO ASPECT
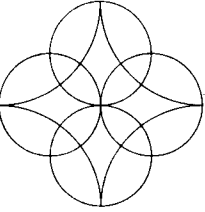
6. Remove the media and replace it with a clean sheet of the same size or use the back side of the used sheet. Load the chart at the load position, and then press the LOAD key to properly install the media.

7. Press the LOCAL key for manual control and use the MANUAL MOVEMENT KEYS to move the pen holder to the location of the viewport marker shown in Figure 2-11. After the pen holder is positioned, initiate the customer confidence test routine by pressing the ▲ and ▼ keys simultaneously. The plotter will draw a large diamond/circle design which will have identical aspect dimensions as the original plot at the present position of the pen.

In the last procedure, you were shown how to use the auto aspect function by specifying points along the x-axis. Repeat the procedure again, but this time, specify y-axis points for auto aspect by using the lower left and upper right scale box markers shown in Figure 2-16 instead of the ones in Figure 2-15 when specifying the scale box corners in step 5. If you have large chart format media installed, use the ◄ key instead of the ▼ key to move from the lower left scale box corner to the upper right scale box corner. If you have small chart format media installed, use the ▲ key instead of the ► key to move from the lower left scale box corner to the upper right scale box corner.

UR SCALE BOX MARKER

LL SCALE BOX MARKER

FIGURE 2-16. LOWER LEFT/UPPER RIGHT (Y-AXIS) SCALE BOX MARKERS

2.8.5 Mirror Image Plots

This section explains how to create a mirror image of a plot design.

1. Insert a clean sheet of large chart media in the plotter and position it at the load position.

2. Press RESET. This causes the window and scale box limits that were set in the previous procedure to default to maximum page.

3. Press LOCAL for manual control of the plotter, and then initiate the customer confidence test routine by pressing ▲ and ▼ simultaneously. After the routine completes, press LOCAL again for manual control.

4. Use the MANUAL MOVEMENT KEYS to move the pen holder to the position of the upper right scale box marker illustrated in Figure 2-17. After the pen holder is positioned, specify this location as the upper right scale box point by pressing ENTER, and then SCALE UR.
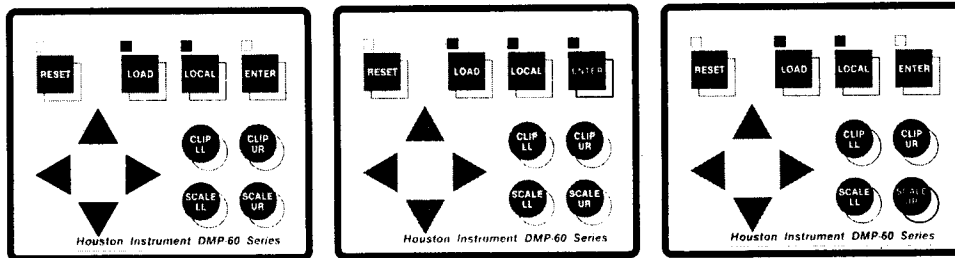
Next, use the MANUAL MOVEMENT KEYS to move the pen holder to the position of the lower left scale box marker illustrated in Figure 2-17. After the pen holder is positioned, specify this location as the lower left scale box point by pressing ENTER, and then SCALE LL. Register the corner points by pressing the LOCAL key.

UR SCALE BOX MARKER

LL SCALE BOX MARKER

FIGURE 2-17. SCALE BOX MARKERS TO CREATE MIRROR IMAGE PLOTS

5. Insert a clean sheet of media of the same size at load position. Press the LOAD key to properly load the new sheet. After the plotter positions the chart, press the LOCAL key for local mode.

6. Initiate the customer confidence test routine by pressing the ▲ and the ▼ keys simultaneously. The resulting plot design will be a mirror image of the customer confidence test plot (see Figure 2-18).

FIGURE 2-18.
MIRROR IMAGE OF THE CUSTOMER CONFIDENCE TEST PLOT

SECTION 3
DM/PL COMMAND SPECIFICATIONS

NOTE
If you have purchased a plotting software package, you may skip this section of the manual since that program will correctly handle the plotter's DM/PL inputs and outputs. You only need to read this section if you are developing your own plotting programs.

3.1   INTRODUCTION

This section contains the information necessary to write plotter programs using the DM/PL plotting language. This includes general information for using DM/PL, detailed descriptions of the various DM/PL commands for this plotter, and programming tips.

3.2   COMMAND FORMAT

The general format of the DM/PL commands is:

MNEMONIC(parameter)

● *Mnemonic* is the one or two character mnemonic (or abbreviation) of the command. This is how the command must be sent to the plotter.

● *Parameter* is additional data required for some of the commands. The parameters (if any) are explained with the command.

3.3   COMMAND ORGANIZATION

The DM/PL commands are described fully in the *DM/PL Command Language Manual,* part number MI-1044 (available as an option from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll-free: 1-800-444-3425). The DM/PL manual describes all DM/PL commands used with various Houston Instrument plotters that support this language. Because of technical differences between the plotters, some of the commands require different parameters in order to operate properly with a given plotter. These commands are noted in the DM/PL manual. However, you will find that most of the commands operate exactly the same for all DM/PL-based plotters.

The DM/PL commands that the DMP-60 plotters support are listed in Paragraph 3.4. These commands are listed by related functional groups for ease of reference. Paragraph 3.4 also lists any required parameters when using a given command with these plotters. Unless otherwise noted in the descriptions of the commands, all listed DM/PL commands are fully supported and operate exactly as described in the DM/PL manual. Otherwise, be sure to observe the parameters given for the command to ensure predictable operation of the plotter.

Note that these are the only DM/PL commands supported by the DMP-60 plotters. If the plotters receive a command that they do not support, the results cannot be predicted. Be sure to check this listing before running any software written for another DM/PL-based plotter to ensure predictable operation.

3.4   DMP-60 DM/PL COMMANDS

The DMP-60 DM/PL commands are listed below.

Select Commands:

Mode One Select

;:

Mode Two Select

;:I*pc d,*

  or

;:I(*nn nn nn nn)pc d,*

Deselect

  @

Plot Setup Commands:

Set Velocity

V*n,*

Pen up velocities are specified in the plotter menu.

English Codes (n)	Velocity (ips)	Metric Codes (n)	Velocity (mm/sec)
1	1	2	25
2	2	6	50
4	4	10	76
6	6	15	127
8	8	20	177
10	10	25	228
12	12	30	279
14	14	35	330
16	16	40	381
18	18	45	431
20	20	50	482
22	22	55	533
24	24	60	584
28*	28	70*	685
32*	32	80*	787

*DMP-61 only. These velocities are mapped to 24 ips/584 mm/s if they are sent to the DMP-62.

Set Window/Viewport Limits

W $wxll, wyll, wxur, wyur, vpxll, vpyll, vpxur, vpyur,$

Frame Advance

F$n,$

Small Chart (Left Plot-Origin)

EH

Large Chart (Right Plot-Origin)

EF

Mode Two Prompt Enable

EB*nn,*

End of Text

ET*nn,*

Addressing Commands:

Absolute Pen Positioning

A

Relative Pen Positioning

R

Coordinate Addressing

EC*n,*

Home Position

H

Set Plot Origin

O

Pen Control Commands:

New Pen

P*n*,

If the pen changer accessory is installed and used on the plotter, this command causes the pen holder to return the presently used pen to its respective pen stall and retrieve a new pen. The pen that is actually retrieved depends on which command is sent and how many pens are specified as being used in the menu (see Section 2.5.5). The New Pen command mapping chart is provided in Table 3-1.

The P*0* causes the pen holder to return the presently used pen to its respective stall and then park at home position.

TABLE 3-1. DM/PL NEW PEN COMMAND MAPPING CHART

PEN CONTROL (Pn)	FUNCTION
P0	Return Pen/move to home
P1	Select pen one
P2	Select pen two
P3	Select pen three
P4	Select pen four
P5	Select pen five
P6	Select pen six
Mapped DM/PL New Pen Commands:	
P7	Select pen one
P8	Select pen two
P1+	Select pen two
P2+	Select pen three
P3+	Select pen four
P4+	Select pen five
P5+	Select pen six
P6+	Select pen one
P7+	Select pen two

Pen Down

D

Pen Up

U

Line Type Commands:

Line Type

L*n*,

Vector Move Commands:

Vector Move

x,y,

Increment Move

n

> *n* is a lower case alphabetic letter.
>
> p = one + y increment
> q = one + x, + y increment
> r = one + x increment
> s = one + x,-y increment
> t = one -y increment
> u = one -x,-y increment
> v = one -x increment
> w = one -x, + y increment
> y = pen up
> z = pen down

Text Commands:

Simple Text

S*rhh*(text)__

Extended Text

S(G*n*, F*n*, S*n*, W*n*, X*n*, Y*n*, C*n*, L*n*, I/NI, NP/P/V, TD/TR, D*n*, H*n*) (text)__

Curve Commands:

Arc Plot

CA *x,y,d,* or

CA(P*n*,H*n*,D*n*,X*n*,Y*n*,L*n*) *x,y,d,*

Circle Plot

CC *x,y,r,* or

CC(P*n*,H*n*,D*n*,X*n*,Y*n*,L*n*) *x,y,r,*

Ellipse Plot

CE *x,y,x1,y1,x2,y2* or

CE(P*n*,H*n*,D*n*,X*n*,Y*n*,L*n*) *x,y,x1,y1,x2,y2,*

Curved Move

CM *x1,y1,x2,y2,d* or

CM(P*n*,H*n*,D*n*,X*n*,Y*n*,L*n*) *x1,y1,x2,y2,d,*

Closed Figure

CF *border list* CS or

CF(P*n*,H*n*,D*n*,X*n*,Y*n*,L*n*) *border list* CS

General Curve Plot

CG $x1,y1,x2,y2,...xn,yn,$ CS

Marker Commands:

Marker Plot

M*hhm,*

Extended Marker Plot

M(S*n*)m,

Inquiry Commands:

Report

ER

Query

Q

Digitize

ED

Elapsed Time

EE

Plotter Control Commands:

Test

T or

T(*n*)

Reset

Z

Plot Pause

EL

UART Setup

EU*nnn*

Pass-Through Port Enable

X

End of Plot

e   This command marks the end of a plot file.

3.5   DM/PL PROGRAMMING CONCEPTS AND RULES

The following paragraphs describe various considerations when writing and using DM/PL plotter programs.

- The plotter **MUST** be "on-line" with the host computer (ready or plot mode) in order to respond to DM/PL commands.

- When writing plotting programs, be sure to leave at least one space or comma as a delimiter between coordinate pairs and DM/PL commands, as explained in the DM/PL manual.

- The basic unit of measurement for the plotter is one increment. The size of the increment depends upon the coordinate addressing (ECn) command presently in effect. To convert a line length from inches to plotter increments multiply by 200 if 0.005 inch addressing (EC5) is in effect, multiply by 1000 if 0.001 inch addressing (EC1) is in effect, multiply by 254 if 0.1 mm addressing (ECM) is in effect, or multiply by 1016 if 0.025 mm addressing (ECN) is in effect. The actual length of a line is not a factor if programming with the EC0 command as long as a 1:1.5 ratio is maintained for x-,y-axial moves.

- A number with either no sign or with a plus (+) sign is considered to be a positive value (for example, 256 or +128). A negative value must always have a minus (-) sign (for example, -64).

● The plotter uses the Cartesian coordinate system to locate the plots on the chart. This system consists of three orthogonal (mutually perpendicular) axes known as x, y, and z. The origin of the system varies according to the chart size as shown in Figures 1-6 and 1-7. The x and y values are both zero at the origin.

Movement in the x- or y-axis depends upon the origin location selected with the plotter menu (regardless of actual chart size). With right origin selected, movement in the x-axis is done by moving the chart in and out of the plotter, and y-axis movement is by moving the pen carriage left and right. With left origin size selected, movement in the x-axis is done by moving the pen carriage left and right, and y-axis movement is done by moving the chart in and out of the plotter. (With auto origin selected, the origin location and axes orientation depend on the chart size installed.) Movement in the z-axis is simply moving the pen up or down regardless of chart orientation.

● The deselect (@) command takes the plotter off-line from the host computer, and retains any plotter parameters presently in effect. The reset (Z) command also takes the plotter off-line from the host computer, but resets all plotter parameters to the default values. In general, it is better to use the deselect command to terminate plotter operation, as explained in the DM/PL manual.

● Note that the following commands are not recommended for use in batch plotting since operator intervention is required or the plotter may send a response when the computer is not expecting it: UART Setup *EU,* Report *ER,* Mode Two Plotter Select *;:I,* Query *Q,* or Digitize *ED.*

● After selecting the plotter and before sending any actual drawing data, be sure to first select a resolution, an addressing mode, a pen, a chart size, and define the plotting area to be used.

SECTION 4
HPGL 758X EMULATION LANGUAGE COMMANDS

NOTE
If you have purchased a plotting software package, you may skip the following paragraphs since that program will correctly handle the plotter's HPGL 758X emulation language (HPGL) inputs and outputs. HPGL operating mode must be selected by entering and exiting the plotter's HPGL menu (see Paragraph 2.6). You only need to read these paragraphs if you are developing your own plotting program. Please remember that the HPGL plotting language is not entirely transportable between all HPGL plotters. This particular emulation of HPGL is for 758X software packages. Packages written for other HPGL plotters may not work correctly.

4.1   INTRODUCTION

This section describes the HPGL 758X emulation language for the plotter. This language allows the Houston Instrument DMP-61 plotter to emulate the HP model 7580B plotter and the DMP-62 plotter to emulate the HP model 7585B plotter. This section contains the information necessary to write plotter programs using Houston Instrument's HPGL 758X emulation language. This includes general information for using HPGL, and detailed descriptions of the various HPGL commands for your plotter.

4.2   COMMAND FORMAT

The general format of the HPGL RS-232-C device control functions is as follows. Note that General Purpose Interface Bus (GPIB or HP-IB, ANSI/IEEE 488-1978 standard) communications protocol described in the HP manuals is not available for your plotter.

ESC.SYMBOL parameter; (parameter):

- *ESC* is the ASCII "escape" character. It is typically obtained from an ESCAPE key on a terminal or as a character sent by the plotting software.

- A period (.) must follow the escape character.

- A *SYMBOL* must follow the period. It must be A, B, E, H, I, J, K, L, M, N, O, P, Q, R, S, T, Y, Z, @, (, or). The alphabetic symbols must be uppercase.

- The *parameter* or *(parameter)*, if any, follow the symbol. Some functions use parameters, while others do not. Some functions have optional parameters, which are indicated in this manual with parentheses. Multiple parameters must be separated by a semicolon (;). The last parameter must be followed by a colon (:). Note that any parameter not specified is set to the default value when a colon or semicolon is detected. It is important to note that the colon and semicolon are for use only with functions that have parameters. These must **NOT** be used with functions that do not have parameters. Otherwise, an error condition will result.

The general format of the HPGL plotting commands is:

MNEMONIC parameter, (parameter) terminator

● The *MNEMONIC* is the two-letter mnemonic (or abbreviation) of the command. The mnemonic can be sent as uppercase or lowercase alphabetic characters. (Uppercase mnemonics are used in this manual.)

● A space may follow the mnemonic and any parameter(s).

● The *parameter* or *(parameter)* is additional data required for some commands. Some commands do not require parameters, while others do. Optional parameters are indicated in this manual with parentheses. Unspecified optional parameters typically assume the previously specified value or the default value. At least one space or comma must separate multiple parameters. If all required parameters are omitted, the command is ignored. However, contrary to the HP documentation, no error number 2 is actually set by the HP plotter (or by this plotter).

● A *terminator* is used to denote the end of the command. The semicolon (;) is the only character recognized as a terminator. However, a following command can also be used as a terminator for a previous command. Therefore, only the last command in a string requires a specific terminator character. (In this manual, the semicolon is used as the terminator.)

A carriage return (CR) is ignored, except when used as a label character or as an output response terminator. Note that the Label *LB* and Buffered Label String *BL* commands must be terminated with a specific label terminator character. The default value is the end of text (ETX) character. However, it can be changed with the Define Label Terminator *DT* command.

4.3   COMMAND ORGANIZATION

The HP 758X HPGL commands that your plotter supports are described in the *Hewlett-Packard 7580B, 7585B, and 7586B Drafting Plotters Interfacing and Programming Manual,* part number 07580-90034, available from HP. In addition to these commands, your plotter also supports the Direction Vertical *DV* command and character set 101 used by the HP DraftPro Plotter. These are described in the *HP DraftPro Plotter Programmer's Reference,* part number 07570-90001, also available from HP. Also, your plotter supports character sets 7, 17, and 27 used by the HP DraftMaster Plotter (these have six additional characters, but are otherwise identical to the HP 758X sets). The reference manual for these is the *HP DraftMaster Programmer's Reference,* part number 07595-90001, available from HP.

The RS-232-C functions that your plotter supports are listed in Table 4-1. These are the device control instructions used to control overall operation of the plotter. Unless otherwise described in the NOTES column, all listed HPGL functions are fully supported and operate exactly as described in the HP manual. Otherwise, be sure to observe the parameters given for the function to ensure predictable operation of the plotter.

TABLE 4-1. HPGL FUNCTION LISTING

NAME	FUNCTION	NOTES
SELECTION COMMANDS:		
Plotter On	ESC.Y or ESC.(	Full support.
Plotter Off	ESC.Z or ESC.)	Full support.
CONFIGURATION COMMANDS:		
Plotter Configuration	ESC.@ (buffer);(mode):	Full support.
Set Handshake Mode 1	ESC.H (block);(enquiry);(r1; ... r10):	Full support.
Set Handshake Mode 2	ESC.I (block);(enquiry);(r1; ... r10):	Full support.
Reset†	ESC.R	Full support.
Set Output Mode	ESC.M (turnaround);(trigger);(echo); (terminator);(terminator);(initiator):	Full support.
Set Extended Output And Handshake Mode	ESC.N (delay);(t1; ... t10):	Full support.
Set Handshake Mode	ESC.P mode: or ESC.P:	Full support.
Set Monitor Mode	ESC.Q mode: or ESC.Q:	Partial support. See Paragraph 4.4.23.
Configure Memory	ESC.T (I/O);(polygon); (downloadable):	Full support.
OUTPUT COMMANDS:		
Output Buffer Space	ESC.B	Full support.
Output Extended Error	ESC.E	Full support.
Output Buffer Size	ESC.L	Full support.
Output Extended Status	ESC.O	Full support.
Output Identification	ESC.A	Partial support. See Paragraph 4.4.1.
Output Memory Size	ESC.S buffer: or ESC.S:	Full support.
ABORT COMMANDS:		
Abort Device Control	ESC.J	Full support.
Abort Graphic Control†	ESC.K	Full support.

NOTES:

† This function also clears the extended buffer if the optional buffer board is installed and enabled in the menu.

The HPGL commands that your plotter supports are listed in Table 4-2. These commands are listed by related functional groups for ease of reference. The table also lists any required parameters when using a given command with your plotter. Unless otherwise described in the NOTES column, all listed HPGL commands are fully supported and operate exactly as described in the HP manual. Otherwise, be sure to observe the parameters given for the command to ensure predictable operation of the plotter.

Note that these are the only HPGL commands supported by your plotter. If the plotter receives a command that it does not support, the results cannot be predicted. Be sure to check this listing before running any software written for another HPGL-based plotter to ensure predictable operation.

Also note that your plotter does not support the General Purpose Interface Bus (GPIB or HP-IB, ANSI/IEEE 488-1978 standard) communications interface and protocol described in the HP manuals. Your plotter always uses the RS-232-C serial communications interface and protocol described in Paragraph 1.9.

TABLE 4-2. HPGL COMMAND LISTING

NAME	COMMAND	NOTES
CONFIGURATION COMMANDS:		
Initialize	IN;	Full support.
Input Masks	IM; or IM (mask),(service),(poll);	Partial support. See Paragraph 4.4.16.
Set Default Values	DF;	Full support.
Input Window	IW xll,yll,xur,yur;	Full support.
Output Window	OW;	Full support.
Input P1 And P2	IP P1x,P1y,(P2x,P2y);	Full support.
Output P1 And P2	OP;	Full support.
Scale	SC; or SC x1,x2,y1,y2;	Full support.
Chord Tolerance	CT type;	Partial support. See Paragraph 4.4.17.
Not Ready	NR;	Partial support. See Paragraph 4.4.2.
Rotate Coordinate System	RO angle;	Full support.
Buffer Plot	BF;	NOP, nothing happens.
Replot	RP;	NOP, nothing happens.
PEN COMMANDS:		
Pen Down	PD; or PD (x1,y1,x2,y2, ... xn,yn);	Full support.
Pen Up	PU; or PU (x1,y1,x2,y2, ... xn,yn);	Full support.
Automatic Pen Pickup	AP; or AP control;	Partial support. See Paragraph 4.4.4.
Select Pen	SP; or SP pen;	Full support.
Plot Absolute	PA x1,y1,(x2,y2, ... xn,yn);	Full support.
Plot Relative	PR x1,y1,(x2,y2, ... xn,yn);	Full support.
Velocity Select	VS; or VS speed,(pen);	Full support.
Velocity Adaptive	VA;	NOP, nothing happens.
Velocity Normal	VN;	NOP, nothing happens.
Acceleration Select	AS; or AS acceleration,(pen);	Full support.
Force Select	FS; or FS force,(pen);	NOP, nothing happens.
Group Pen	GP (group),(first),(total),(length);	Partial support. See Paragraph 4.4.22.
Select Pen Group	SG; or SG group;	Partial support. See Paragraph 4.4.18.

TABLE 4-2. HPGL COMMAND LISTING (Continued)

NAME	COMMAND	NOTES
LINE COMMANDS:		
Designate Line	LT; or LT type,(length);	Full support.
Tick Length	TL positive,(negative);	Full support.
X-Axis Tick	XT;	Full support.
Y-Axis Tick	YT;	Full support.
CURVE COMMANDS:		
Circle	CI radius,(chord);	Partial support. See Paragraph 4.4.5.
Arc Absolute	AA x,y,angle,(chord);	Partial support. See Paragraph 4.4.6.
Arc Relative	AR x,y,angle,(chord);	Partial support. See Paragraph 4.4.7.
CHARACTER COMMANDS:		
Designate Standard Character Set	CS; or CS set;	Partial support. See Paragraph 4.4.8.
Designate Alternate Character Set	CA; or CA set;	Partial support. See Paragraph 4.4.9.
Select Standard Character Set	SS;	Full support.
Select Alternate Character Set	SA;	Full support.
Define Label Terminator	DT; or DT terminator;	Full support.
User Defined Character	UC pc,x1,y1,(x2,y2),(pc), ... (pc),(xn,yn);	NOP, nothing happens.
Symbol Mode	SM; or SM symbol;	Full support.
Label	LB label,terminator;	Full support.
Absolute Character Size	SI; or SI width,height;	Full support.
Relative Character Size	SR; or SR width,height;	Full support.
Absolute Character Slant	SL angle;	Full support.
Character Plot	CP; or CP width,height;	Full support.
Absolute Direction	DI; or DI run,rise;	Full support.
Relative Direction	DR; or DR run,rise;	Full support.
Buffered Label String	BL label,terminator;	Full support.
Character Chord Angle	CC; or CC angle;	NOP, nothing happens.
Character Selection Mode	CM; or CM switch,(fallback);	NOP, nothing happens.

TABLE 4-2. HPGL COMMAND LISTING (Continued)

NAME	COMMAND	NOTES
Downloadable Character	DL; or DL character; or DL character,(pc),x1,y1,(x2,y2, ... xn,yn);	NOP, nothing happens.
Designate Character Set Into Slot	DS slot,set;	NOP, nothing happens.
Extra Space	ES; or ES character,(line);	Full support.
Invoke Character Set	IV slot,(position);	NOP, nothing happens.
Label Origin	LO; or LO location;	Full support.
Output Label Length	OL;	Full support.
Print Buffered Label	PB;	Full support.
Input Character	IC character	NOP, nothing happens.
Write To Display	WD EOT or WD characters EOT	NOP, nothing happens.
Direction Vertical	DV; or DV (direction);	Full support.
DIGITIZING COMMANDS:		
Digitize Point	DP;	Partial support. See Paragraph 4.4.10.
Output Digitized Point	OD;	Full support.
Digitize Clear	DC;	Full support.
STATUS COMMANDS:		
Output Identification	OI;	Partial support. See Paragraph 4.4.11.
Output Status	OS;	Partial support. See Paragraph 4.4.12.
Output Factors	OF;	Full support.
Output Error	OE;	Full support.
Output Actual Position	OA;	Partial support. See Paragraph 4.4.3.
Output Commanded Position	OC;	Full support.
Output Options	OO;	Full support.
Output Hard-Clip Limits	OH;	Full support.
Output Carousel Type	OT;	Partial support. See Paragraph 4.4.19.
Output Character Box Dimensions	OB;	Partial support. See Paragraph 4.4.20.
Output Key	OK;	Partial support. See Paragraph 4.4.21.

TABLE 4-2. HPGL COMMAND LISTING (Continued)

NAME	COMMAND	NOTES
CHART COMMANDS:		
Advance Full Page	AF; PG; or PG1;	NOP, nothing happens.
Advance Half Page	AH;	NOP, nothing happens.
Enable Cut Line	EC; or EC1;	NOP, nothing happens.
Advance Frame	FR;	NOP, nothing happens.
POLYGON COMMANDS:		
Edge Rectangle Absolute	EA xur,yur;	Full support.
Edge Rectangle Relative	ER xur,yur;	Full support.
Edge Polygon	EP;	Full support.
Edge Wedge	EW radius,angle,sweep,(chord);	Partial support. See Paragraph 4.4.13.
Fill Polygon	FP;	Full support.
Fill Type	FT type,space,angle;	Full support.
Polygon Mode	PM; or PM operation;	Partial support. See Paragraph 4.4.15.
Pen Thickness	PT; or PT width;	Full support.
Fill Rectangle Absolute	RA xur,yur;	Full support.
Fill Rectangle Relative	RR xur,yur;	Full support.
User Defined Fill Type	UF gap1,(gap2, ... gap20);	Full support.
Fill Wedge	WG radius,angle,sweep,(chord);	Partial support. See Paragraph 4.4.14.

4.4   HPGL EXCEPTIONS

Except for the differences described in the following paragraphs, the HPGL functions and commands for your plotter operate exactly as described in the HP manuals.

4.4.1   Output Identification

ESC.A

To maintain software compatibility, a Houston Instrument plotter responds with an appropriate equivalent HP plotter model number as listed in Table 4-3.

TABLE 4-3. IDENTIFICATION RESPONSE

HOUSTON INSTRUMENT PLOTTER	HEWLETT-PACKARD PLOTTER (IDENTIFICATION RESPONSE)
DMP-61	7580B
DMP-62	7585B

4.4.2   Not Ready

NR;

Upon receipt of this command, the plotter goes to Local Mode and extends the chart fully forward for viewing. Press the LOCAL key to resume plotting.

4.4.3   Output Actual Position

OA;

If the pen is parked due to inactivity during a plot (according to the *AUTO-PEN CAPPING* set in the menu), your plotter reports the parked location as the actual position for this command.

4.4.4   Automatic Pen Pickup

AP; or *AP control;*

This command is ignored. For your plotter, a pen is automatically raised from the plotting surface after approximately two seconds of inactivity. This prevents the ink in the pen tip from bleeding on the media. The plotter does, however, have an *AUTO-PEN CAPPING* menu parameter which enables you to specify a delay time before it returns a pen to its proper pen stall (if the pen changer accessory is installed). Typical values that you can set are 15 seconds for drafting pens or 60 seconds for hard nib pens before automatic storage to the pen changer stall.

4.4.5   Circle

CI radius,(chord);

If the Chord Tolerance *CT* command specifies chord deviation or this command specifies a chord of 5° or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the circle.

4.4.6   Arc Absolute

AA x,y,angle,(chord);

If the Chord Tolerance *CT* command specifies chord deviation or this command specifies a chord of 5° or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the arc.

4.4.7   Arc Relative

AR x,y,angle,(chord);

If the Chord Tolerance *CT* command specifies chord deviation or this command specifies a chord of 5° or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the arc.

4.4.8   Designate Standard Character Set

CS; or *CS set;*

Note that this Houston Instrument plotter always draws the characters with an arc font. The character spacing is automatically adjusted to simulate HP fixed-space or variable-space arc or vector fonts. Character sets 0 through 59, 99, and 101 are supported as shown in Table 4-4. Character set -1, the downloadable character set, is not supported. The various character sets are described in Paragraph 4.8. Notice that only the fixed-space vector font versions of the characters are shown (0 through 9, 30 through 39, and 99). The variable-space arc font and fixed-space arc font versions(10 through 29 and 40 through 59) are identical except for character spacing. Character set 101 is only available if the Kanji option board is installed and enabled in the menu. Character set 101 is shown in the DM/PL Manual. All characters are available in each set; however, some characters may be formed slightly different than in the equivalent HP set.

TABLE 4-4. HPGL CHARACTER SETS

PARAMETER			
FIXED-SPACE VECTOR FONT	VARIABLE-SPACE ARC FONT	FIXED-SPACE ARC FONT	CHARACTER SET
0	10	20	ANSI ASCII
1	11	21	HP 9825 plotter
2	12	22	French/German
3	13	23	Scandinavian
4	14	24	Spanish/Latin American
5†	15†	25†	Special Symbols
6†	16†	26†	JIS ASCII
7†	17†	27†	Roman Extensions
8	18	28	Katakana
9	19	29	ISO International Reference Version
30	40	50	ISO Swedish
31	41	51	ISO Swedish for names
32	42	52	ISO Norway Version 1
33	43	53	ISO German
34	44	54	ISO French
35	45	55	ISO United Kingdom
36	46	56	ISO Italian
37	47	57	ISO Spanish
38	48	58	ISO Portuguese
39	49	59	ISO Norway Version 2
99	—	—	Drafting
101†	—	—	Kanji

NOTES:

†   Menu *ZERO CHARACTER* settings are ignored for this character set.

4.4.9   Designate Alternate Character Set

CA; or *CA set;*

Note that this Houston Instrument plotter always draws the characters with an arc font. The character spacing is automatically adjusted to simulate HP fixed-space or variable-space arc or vector fonts. Character sets 0 through 59, 99, and 101 are supported as shown in Table 4-4. Character set -1, the downloadable character set, is not supported. The various character sets are described in Paragraph 4.8. Notice that only the fixed-space vector font versions of the characters are shown (0 through 9, 30 through 39, and 99). The variable-space arc font and fixed-space arc font versions (10 through 29 and 40 through 59) are identical except for character spacing. Character set 101 is only available if the Kanji option board is installed and enabled in the menu. Character set 101 is shown in the DM/PL Manual. All characters are available in each set; however, some characters may be formed slightly different than in the equivalent HP set.

4.4.10   Digitize Point

DP;

After receipt of the Digitize Point command, your plotter enters Digitize mode, as indicated by the ENTER LED blinking on the control panel. Press the LOCAL key. Use the control panel direction keys to position the pen over the desired point to be digitized. Press the ENTER key to enter the x-,y-coordinates. The ENTER LED blinks until the ENTER key is pressed or the host sends the Digitize Clear *DC* command. Typically, the Output Status *OS* command is sent to see if the plotter has digitized data to report. The plotting software then reads the digitized information with the Output Digitized Point *OD* command. Note that this plotter reports the last software-commanded pen status (up or down) as the digitized pen status.

4.4.11 Output Identification

OI;

To maintain software compatibility, a Houston Instrument plotter responds with an appropriate equivalent HP plotter model number as listed in Table 4-3.

4.4.12 Output Status

OS;

Note that bit 4 (ready for data) is always set for Houston Instrument plotters. (For HP plotters, this bit can be cleared.)

4.4.13 Edge Wedge

EW radius,angle,sweep,(chord);

If the Chord Tolerance *CT* command specifies chord deviation or this command specifies a chord of 5° or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the wedge.

4.4.14 Fill Wedge

WG radius,angle,sweep,(chord);

If the Chord Tolerance *CT* command specifies chord deviation or this command specifies a chord of 5° or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the wedge.

4.4.15 Polygon Mode

PM; or *PM operation;*

If the Chord Tolerance *CT* command specifies chord deviation or this command specifies a chord of 5° or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the curved portions of the polygon.

4.4.16 Input Masks

IM; or *IM (mask),(service),(poll);*

The *service* and *poll* parameters are ignored since these only have meaning for the GPIB or HP-IB communications interface, which is not used with your plotter.

4.4.17 Chord Tolerance

CT type;

If chord deviation or degrees less than or equal to 5° is specified, then the plotter automatically uses a Houston Instrument smooth curve routine to draw a circle, arc, wedge, or polygon. However, if the Line Type *LT0* command is in effect, the plotter automatically uses 5° chords to draw the dots at the plotted points for the deviation chord type. For chord angles *(CT0;)* while the *LT0* command is in effect, the plotter will use the specified degrees to draw the dots at the plotted points, even if the specified degrees are less than 5° chords.

4.4.18 Select Pen Group

SG; or *SG group;*

This plotter always uses the first pen designated in the group with the Group Pen *GP* command.

4.4.19   Output Carousel Type

OT;

This plotter always reports a drafting type carousel (3) and the number of pens enabled in the menu (1 for one pen, 3 for two pens, 7 for three pens, 15 for four pens, 31 for five pens, or 63 for six pens). For example, if the plotter has six pens enabled in the menu, then the response is 3,63.

4.4.20   Output Character Box Dimensions

OB;

This plotter always responds to this command by sending all zeros (0.0000, 0.0000, 0.0000, 0.0000).

4.4.21   Output Key

OK;

This plotter always responds to this command by sending a zero (0).

4.4.22   Group Pen

GP (group),(first),(total),(length);

For this command, the plotter always ignores any *total* or *length* parameters.

4.4.23   Set Monitor Mode

ESC.Q mode: or *ESC.Q:*

Since this plotter has only one serial port, the hardware does not fully support this function even though the software does support it.

4.5   CONTROLS AND INDICATORS

Certain software may require use of plotter controls and indicators for proper operation. Table 4-5 is a listing of the various controls and indicators found on HP model 758X plotters and the equivalents for your plotter. This listing may also be helpful for anyone upgrading from an HP plotter to this Houston Instrument plotter.

TABLE 4-5. INDICATOR AND CONTROL EQUIVALENTS

HP 758X PLOTTER	DMP-60 SERIES PLOTTER
LINE switch.	Power switch.
LINE indicator.	Control panel LEDs.
DSR indicator.	None (as with HP 7586B).
OUT OF LIMIT indicator.	None.
ERROR indicator.	Flashes RESET LED for HPGL language errors. Also, see Appendix A for other error indications.
CHART HOLD switch & indicator.	Pinch roller lever arms & LOAD key.
RESET switch.	RESET key.
CHART UNLOAD switch & indicator.	Pinch roller lever arms & LOAD key (loads new sheet).
CLEAR switch.	LOAD key (loads new sheet, clears buffer & performs partial & default resets).
VIEW switch & indicator.	▲ ▼ keys in Local Mode.
REMOTE switch & indicator.	None needed, can be selected after chart is loaded (in Ready Mode).
P1 P2 switches.	None.
AXIS ALIGN switch.	None.
ENTER switch & indicator.	ENTER key.
BYPASS switch & indicator.	None.
ROTATE switch & indicator.	Menu mode chart orientation selection.
NEXT PAGE switch.	None.
PEN display.	None.
PEN SELECT 1 thru 8 switches.	Pens are selected only by remote commands and by number of pens specified in menu.
ALL PENS switch.	Menu mode pen speed settings.
PEN SPEED switch & indicator.	Menu mode pen speed setting & ENTER key while not in Local Mode.
PEN FORCE switch & indicator.	None.
PEN UP switch.	ENTER & LOCAL keys simultaneously toggles pen while in Local Mode.
PEN DOWN switch.	ENTER & LOCAL keys simultaneously toggles pen while in Local Mode.

TABLE 4-5. INDICATOR AND CONTROL EQUIVALENTS (Continued)

HP 758X PLOTTER	DMP-60 SERIES PLOTTER
JOYSTICK.	► ◄ ▲ ▼ switches in Local Mode, Window Mode, Digitize Mode.
CONFIDENCE TEST switch.	▲ ▼ switches simultaneously in Local Mode.
CALIBRATE/NORMAL switch.	None.
EMULATE/NORMAL switch.	None, always in normal mode.
EXPAND/NORMAL switch.	None.
INTERFACE MODE HP-IB/RS-232-C switch.	None, RS-232-C at all times.
RS-232-C indicator.	None, RS-232-C at all times.
HP-IB indicator.	None, RS-232-C at all times.
HP-IB LISTEN ONLY/NORMAL switch.	None, RS-232-C at all times.
HP-IB ADDRESS A1 thru A5 switches.	None, RS-232-C at all times.
HP-IB PORT connector.	None, RS-232-C at all times.
STANDALONE/EAVESDROP switch.	Menu mode eavesdrop mode setting.
MONITOR MODE/NORMAL switch.	None, always in normal mode.
LOCAL/NORMAL switch.	None, always in normal mode.
PARITY ON/OFF and EVEN/ODD switches.	Menu mode parity setting.
DUPLEX HALF/FULL switch.	None, always half duplex.
HARDWARE/MODEM switch.	None, use either hardware or software according to cabling.
DTR BYPASS/NORMAL switch.	Menu mode RTS/DTR mode setting.
BAUD RATE switch.	Menu mode baud rate setting.
COMPUTER/MODEM connector.	Data connector.
TERMINAL connector.	None, configure with cabling.
None.	Enlarge/reduce plot size in Window Mode.
None.	Plot mirror image in Window Mode.
None.	Set window & viewport to "cut & paste" plot in Window Mode.
None.	Aspect control using CLIP & SCALE keys in Window Mode.

4.6　HPGL CHART ORIENTATION

Chart orientation when HPGL is the active plot language is slightly different from that used when DM/PL is active. The following paragraphs explain these differences.

Chart orientation for half chart or full chart with HPGL is shown in Figure 4-1. Notice that the plot (axes) origin is always located at the center of the chart. Its position does not change with chart orientation as it does when DM/PL is active. The default locations for the P1 and P2 points are 15 mm (600 plotter units) inside the hard clip limits for the chart.
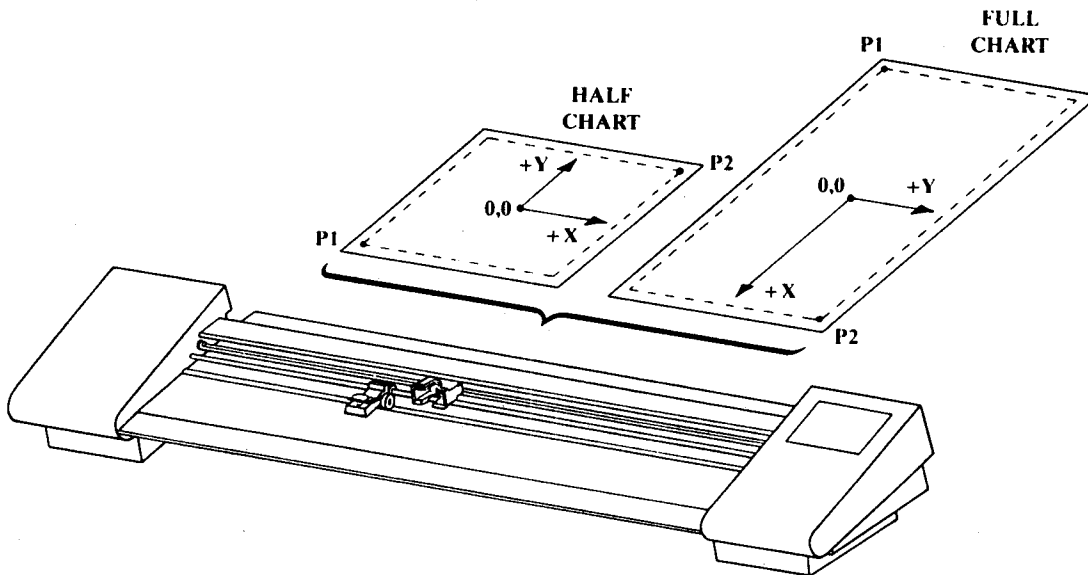

FIGURE 4-1. HPGL CHART ORIENTATION

The HPGL Rotate *RO* command is similar to the DM/PL Large (full) Chart *EF* and Small (half) Chart *EH* commands. The main difference is that in full chart *(RO0)* the lower left corner is located in the corner opposite that of the usual DM/PL lower left corner.

The menu settings for half and full chart orientation operate as when DM/PL is the active plot language. That is, they place the plotter into rotate off *(RO0)* for full chart and rotate on *(RO90)* for half chart.

The front panel LOAD and RESET keys operate as they do when DM/PL is the active plot language. The actual chart orientation at the time the LOAD or RESET key is pressed determines if a half or full chart size is used if the *PLOT-ORIGIN* parameter is set to *AUTO* in the menu, as it does in DM/PL.

For HP plotters, pressing the ROTATE switch toggles rotate on and off from the control panel. This typically results in the P1 and P2 points moving off the chart. If this is not desired, then pressing the ENTER switch before pressing ROTATE causes the P1 and P2 points to remain on the chart following the rotation. For your plotter, the equivalent is to change chart orientation with the menu setting to toggle rotate on or off. The P1 and P2 points remain on the chart because this plotter executes a reset upon exit from the menu.

4.7   HPGL ERRORS

If this plotter has an error while HPGL is the active plotting language, it flashes the RESET LED. The error code can be retrieved using the Output Extended Error *ESC.E* function or the Output Error *OE* command. The various error codes for this plotter are listed in Table 4-6.

TABLE 4-6. HPGL ERRORS

ERROR NUMBER	DESCRIPTION
COMMAND ERRORS:	
0	No errors.
1	Command not recognized.
2	Wrong number of parameters.
3	Parameters out of range or illegal character.
4	Not used.
5	Unknown character set.
6	Position overflow.
7	Polygon or downloadable character buffer overflow
8	Page advance command AF, AH, FR, or PG received.
FUNCTION ERRORS:	
0	No I/O errors.
10	Output function received while another was in progress. The first continues, while the other is ignored.
11	Invalid byte received after ESC..
12	Invalid byte received while parsing a device control function. The parameter and all following are defaulted.
13	Parameter out of range.
14	Too many parameters received. Excess parameters are ignored.
15	Framing, parity, or overrun error has occurred.
16	Input buffer overflow. One or more data bytes lost.
17	Baud rate mismatch or cabling error.
18	Indeterminate I/O error.

4.8   CHARACTER SETS

The Kanji option characters used in DM/PL character set G11 and HPGL character set 101 are JIS X 0208 Kanji Level 1 characters.

For HPGL, the standard ASCII character set shown in Figure 4-2 is used by most host computers. If you select any other character set, then certain characters of that set are substituted for characters from the standard character set. Figure 4-3 shows which particular characters are substituted for a given ASCII character for the HP 9825 Plotter, French/German, Scandinavian, Spanish/Latin American, JIS ASCII, ISO International Reference Version, ISO Swedish, ISO Swedish For Names, ISO Norway Version 1, ISO German, ISO French, ISO United Kingdom, ISO Italian, ISO Spanish, ISO Portuguese, ISO Norway Version 2, and Drafting character sets (all other characters are identical to the ASCII set). Figure 4-4 shows which particular Special Symbol characters are substituted for a given ASCII code. The Roman Extensions character set substitutions for ASCII character codes are shown in Figure 4-5. Figure 4-6 shows which particular Katakana characters are substituted for a given ASCII character code. Notice in the figures that only the fixed-space vector font versions of the character sets are shown (0 through 9, 30 through 39, and 99). The variable-space arc font and fixed-space arc font versions (10 through 29 and 40 through 59) are identical except for character spacing. Character set 101 is only available if the Kanji option board is installed. Character set 101 is shown in the DM/PL manual. All characters are available in each set; however, some characters may be formed slightly different than the equivalent HP set.

The Kanji option characters used in HPGL character set 101 are JIS X 0208 Kanji Level 1 characters. It is important to note that Kanji characters are selected with a two byte sequence. That is, two ASCII character codes must be sent to select a single Kanji character. For example, sending the ASCII ! and ; characters (decimal 33 and 59) selects the Kanji character set ○ character. All other character set substitutions are made on a one-for-one basis. For example, sending the ASCII # character (decimal 35) selects the £ character of the French character set.

	0	1	2	3	4	5	6	7	8	9
30				!	"	#	$	%	&	'
40	(	)	*	+	,	–	.	/	0	1
50	2	3	4	5	6	7	8	9	:	;
60	<	=	>	?	@	A	B	C	D	E
70	F	G	H	I	J	K	L	M	N	O
80	P	Q	R	S	T	U	V	W	X	Y
90	Z	[	\	]	^	_	`	a	b	c
100	d	e	f	g	h	i	j	k	l	m
110	n	o	p	q	r	s	t	u	v	w
120	x	y	z	{			}	~			

FIGURE 4-2. HPGL ANSI ASCII CHARACTER SETS (0, 10, 20)

CHARACTER SET CODES	035	036	064	091	092	093	094	096	123	124	125	126	CHARACTER SET
(0,10,20)	#	$	@	[	\	]	^	`	{	|	}	~	ANSI ASCII
(1,11,21)	#	$	@	[	Γ	]	↑	`	¶	⊢	→	~	HP 9825 PLOTTER
(2,12,22)	£	$	@	[	ç	]	^	`	̈	̇	̄	̇	FRENCH/GERMAN
(3,13,23)	£	$	@	Æ	Å	ø	æ	`	̈	̇	̄	̇	SCANDINAVIAN
(4,14,24)	¿	$	@	[	¡	]	^	`	~	̈	~	~	SPANISH/LATIN AMERICA
(6,16,26)	#	$	@	[	¥	]	^	`	{	|	}	~	JIS ASCII
(9,19,29)	#	¤	@	[	\	]	^	`	{	|	}	‾	ISO INTERNATIONAL REFERENCE VERSION
(30,40,50)	#	¤	@	Ä	Ö	Å	^	`	ä	ö	å	‾	ISO SWEDISH
(31,41,51)	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü	ISO SWEDISH FOR NAMES
(32,42,52)	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	‾	ISO NORWAY VERSION 1
(33,43,53)	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß	ISO GERMAN
(34,44,54)	£	$	à	°	ç	§	^	`	é	ù	è	̈	ISO FRENCH
(35,45,55)	£	$	@	[	\	]	^	`	{	|	}	‾	ISO UNITED KINGDOM
(36,46,56)	£	$	§	°	ç	é	^	ù	à	ò	è	ì	ISO ITALIAN
(37,47,57)	£	$	§	¡	Ñ	¿	^	`	°	ñ	ç	~	ISO SPANISH
(38,48,58)	#	$	§	Ã	Ç	Õ	^	`	ã	ç	õ	°	ISO PORTUGUESE
(39,49,59)	§	$	@	Æ	Ø	Å	^	`	æ	ø	å	~	ISO NORWAY VERSION 2
(99)	¢	$	@	[	⌀	]	⊥	'	µ	̇	•	~	DRAFTING

FIGURE 4-3.
HPGL HP 9825 PLOTTER (1, 11, 21), FRENCH/GERMAN (2, 12, 22), SCANDINAVIAN (3, 13, 23), SPANISH/LATIN AMERICAN (4, 14, 24), JIS ASCII (6, 16, 26), ISO INTERNATIONAL REFERENCE VERSION (9, 19, 29), ISO SWEDISH (30, 40, 50), ISO SWEDISH FOR NAMES (31, 41, 51), ISO NORWAY VERSION 1 (32, 42, 52), ISO GERMAN (33, 43, 53), ISO FRENCH (34, 44, 54), ISO UNITED KINGDOM (35, 45, 55), ISO ITALIAN (36, 46, 56), ISO SPANISH (37, 47, 57), ISO PORTUGUESE (38, 48, 58), ISO NORWAY VERSION 2 (39, 49, 59), AND DRAFTING (99) CHARACTER SETS

FIGURE 4-4. HPGL SPECIAL SYMBOLS CHARACTER SETS (5, 15, 25)

	0	1	2	3	4	5	6	7	8	9
30				À	Â	È	Ê	Ë	Î	Ï
40	´	`	^	¨	~	Ù	Û	£	¯	Ý
50	ý	˙	Ç	ç	Ñ	ñ	¡	¿	¤	£
60	¥	§	ƒ	¢	â	ê	ô	û	á	é
70	ó	ú	à	è	ò	ù	ä	ë	ö	ü
80	Å	î	Ø	Æ	å	í	ø	æ	Ä	ì
90	Ö	Ü	É	ï	ß	Ô	Á	Ã	ã	Đ
100	đ	Í	Ì	Ó	Ò	Õ	õ	Š	š	Ú
110	Ÿ	ÿ	Þ	þ	·	µ	¶	¾	–	¼
120	½	ª	º	«	□	»	±			

FIGURE 4-5. HPGL ROMAN EXTENSIONS CHARACTER SETS (7, 17, 27)

FIGURE 4-6. HPGL KATAKANA CHARACTER SETS (8, 18, 28)

SECTION 5
OPERATOR MAINTENANCE AND CLEANING

5.1   OPERATOR MAINTENANCE

Your plotter has several sliding surfaces. These are made of smooth metals and plastics so that they are essentially friction-free and require no lubricants. These will, however, collect dust and lint which will adversely affect the performance of the plotter. Keep the plotter as clean as possible by using a dust cover. When necessary, clean the unit with a soft cloth dampened with isopropyl alcohol or mild detergent. (Do not use abrasives.)

Ink On Plotter Surface:

Use a clean cloth dampened in a concentrated solution of soap and water; squeeze out excess water and then scrub the affected surface. Be sure that no water drips into the plotter as this will cause electrical shorting of the internal components. Do not use any aerosol cleaners, such as TV contact cleaner, household wall cleaners, or anything containing a solvent; these may damage certain components.

Care of Media:

The plotting media should be handled by its edges. Pen skipping may occur if the media has smudges or has been permeated with oil, grease, perspiration, or other contaminants.

Pen Care:

Disposable technical pens should be stored in their storage box. Always cap unused pens.

Optical Chart Sensor Care:

Improper chart sensing may result if dirt, dust, or other debris should collect in the chart sensor hole, which is located on the top right side of the rear platen. When necessary, use compressed air or a small soft brush to clear debris from the hole above the sensor.

5.1.1   Cleaning Friction Drive Wheels

The friction drive wheel area of the plot drum can become clogged with accumulated residue from the plotting materials. This can cause slippage of the plotting material between the plot drum and the pinch rollers, resulting in inaccurate plots.

The following procedure explains how to clean the friction drive wheels when necessary. Note that the special cleaning strips (part number DMP40-303) are available from Houston Instrument or your product distributor.

1.   Remove plotting material from the unit.

2.   Place the plotter into manufacturing setup mode level 1 (MSM/L1) as explained in Appendix B.

3.   Remove the plotting media if installed, and then place the plotter in MSM/L1 local mode. This enables you to use the control panel manual movement keys without a chart installed in the plotter.

4.   Remove the protective liner from the cleaning strip.

5.   Open the right pinch roller arm.

6.   Place the cleaning strip between the pinch roller and the plot drum, with the tacky side of the cleaning strip toward the friction drive wheel as shown in Figure 5-1.

7.   Using the ▲ and ▼ switches on the control panel, slew the cleaning strip back and forth several times until all residue is removed from the friction drive wheel.

8.   Open the right pinch roller arm and remove the cleaning strip.

9.   Repeat steps five through eight for the left friction drive wheel at each chart size setting.

10.   Set the plotter's power switch to OFF.

11.   Residue can be removed from the cleaning strip by washing it in cold water. Thoroughly dry the cleaning strip and replace its protective lining.
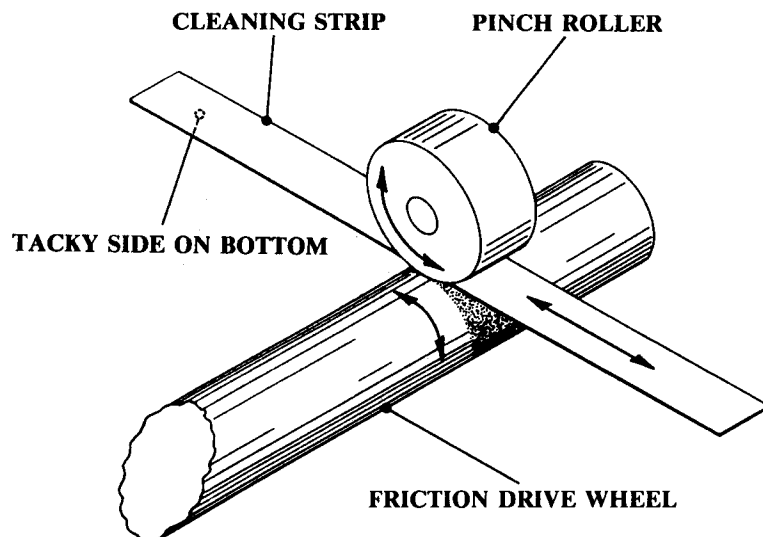

FIGURE 5-1. CLEANING FRICTION DRIVE WHEELS

5.2 OPERATING VOLTAGE CONVERSION

The plotter will operate on either 100, 120, 220, or 240 Vac line voltage. (See Table 1-1 for the minimum and maximum operating ranges for these voltage ratings.) Your plotter may be equipped with either of two power entry modules. The following paragraphs explain how to change the voltage settings and the fuse on both types of modules.

On one type of power entry module, the cover shows four possible voltage settings (100V, 120V, 220V, or 240V). Notice that a pin will be in one of these holes, indicating the present voltage setting for the plotter. If this setting does not match the voltage available at your site, then it must be changed before powering on the plotter. Figure 5-2 shows an example setting for 120 Vac operation.
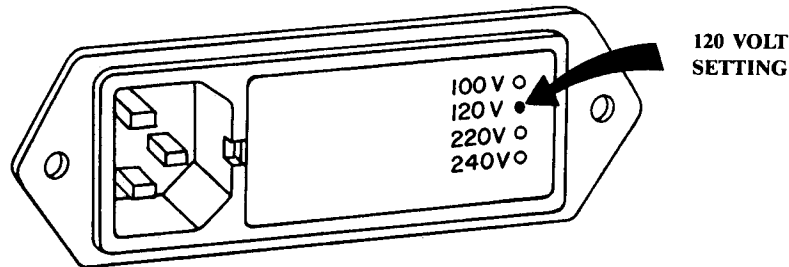
FIGURE 5-2. EXAMPLE 120 VOLT SETTING

Follow the steps below to change a fuse or convert the operating voltage of a plotter having this type of power entry module.

1. Set the plotter power switch to OFF.

2. Unplug the power cord from the ac wall outlet and from the power cord receptacle on the power entry module. See Figure 5-3.

3. Using a small flat blade screwdriver or similar tool inserted into the slot at the left edge of the cover, carefully pry the cover off the fuse cavity.

4. To change the voltage setting, grasp the white plastic voltage select board pin and pull straight outward until the voltage select board unseats from the power entry module. Hold the board so that you can read the four voltage selection labels (100, 120, 220, and 240) imprinted on the board. Move the voltage indicator pin to the opposite side of the board from the desired voltage label. Be sure to seat the pin in the notch provided on the board's edge. Install the voltage select board so that it is fully seated in the voltage select cavity (the label side toward the fuse cavity).

5. To change the fuse(s), remove the fuse(s) from the fuse carrier on the back of the cover. For 100 or 120 Vac operation, the fuse rating is 1 Amp, Slo-Blo. For 220 or 240 Vac operation, the fuse rating is 0.5 Amp, Slo-Blo. Be sure to use the correct rating for your voltage selection. For installation, insert the fuse(s) of the proper rating into the fuse carrier.

6. To change the fuse arrangement to match that used in your country, remove the screw from the fuse carrier, remove the fuse carrier, turn the fuse carrier so that the desired fuse arrangement (single fuse or dual fuses) is facing outward, install the fuse carrier, and install the screw. For United States type power operation, use a single standard AGC or 3AG 0.25 inch × 1.25 inches fuse of the correct rating. For European type power operation, use two standard 5.2 mm × 20 mm fuses of the correct rating. For European use, it is important to note that if your local electrical code does not allow a dual fuse arrangement, then a dummy fuse must be installed in the lower fuse carrier. Otherwise, the plotter will not operate.

7.   Place the cover on the power entry module and press inward until it snaps into place. Verify that the desired operating voltage is indicated with the voltage select board pin on the cover label.

8.   Connect the power cord to the power entry module and wall outlet. The plotter is now ready to be operated on the selected ac line voltage.
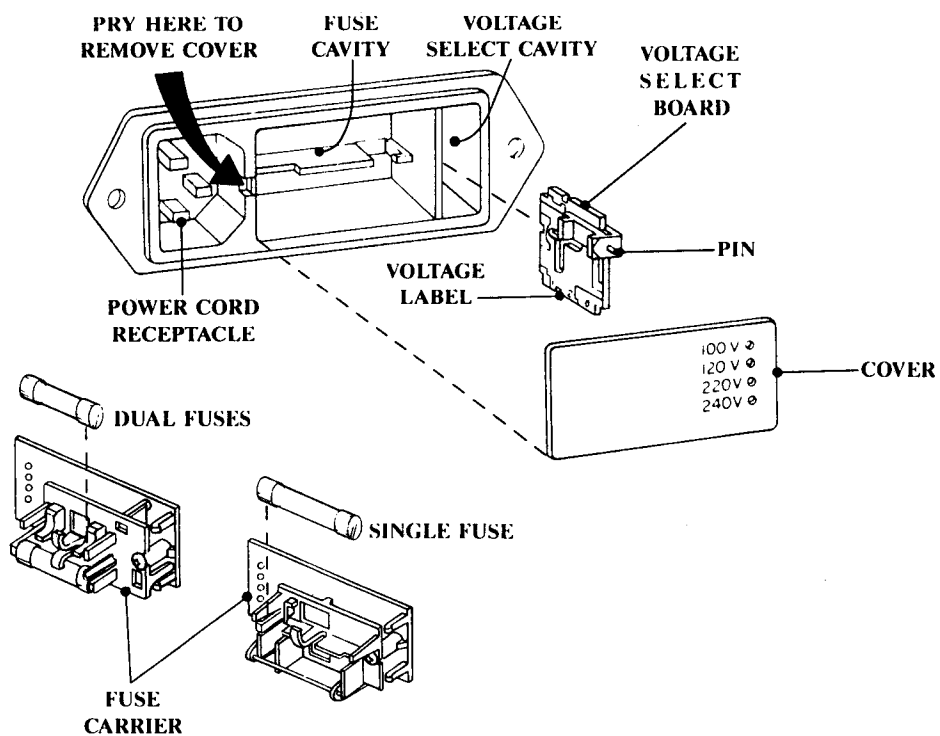

FIGURE 5-3. POWER ENTRY MODULE

The other type of power entry module has a fuse cavity behind a clear plastic protective cover. Inside the cavity is a numbered (100, 120, 220, or 240) voltage select board. The number visible on the voltage select board indicates the present voltage setting of the plotter. If this setting does not match the voltage available at your site, then it must be changed before powering on the plotter.

Follow the steps below to change a fuse or convert the operating voltage of a plotter having this type of power entry module.

1. Set the plotter's power switch to OFF.

2. Unplug the ends of the power cord from the ac wall outlet and from the ac receptacle on the bottom panel of the plotter.

3. Slide the clear plastic protective window to the left (see Figure 5-4).

4. Pull the "FUSE PULL" lever out and remove the fuse.

5. Pull the voltage select board, which is located inside the fuse cavity below the fuse holder, out from the fuse cavity. As shown in Figure 5-4, one side of the voltage select board has the numbers "120" and "240" printed on it, and the other side has the numbers "220" and "100." The numbers indicate the operating voltage of 120, 240, 220, and 100 Vac. Hold the board in your hand so the number that reflects the desired operating voltage ("100," "120," "220," or "240") appears upright on the left side of the voltage select board. (The other number will appear upside down.) While holding the board in this position, slide it back into its place inside the fuse cavity (see Figure 5-4). The number that indicates the operating voltage will now be visible from the outside of the fuse cavity window.

WARNING
Do not re-install the fuse that was removed in step 4. The fuse rating for 100/120 Vac and 220/240 Vac are different and must correspond to the operating voltage to prevent possible damage to the plotter. If you are converting the plotter to either 100 or 120 Vac, install a 250V 3AG 1.0 AMP fuse. If you are converting it to 220 or 240 Vac, install a 250V 3AG 0.5 AMP fuse.

6.   Close the protective window over the fuse cavity by sliding it to the right.

7.   Connect the power cord. The plotter is now ready to be operated on the selected ac line voltage.
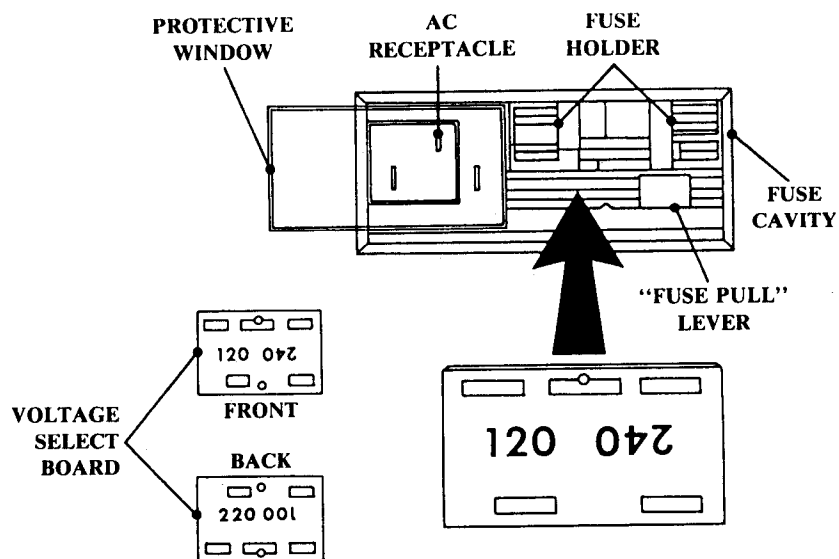

FIGURE 5-4. EXAMPLE 120 VAC CONVERSION (AC FUSE CAVITY)

5.3   PRODUCT SERVICE SUPPORT

If you need technical assistance or if you suspect a problem with your Houston Instrument equipment, contact Houston Instrument at 1-800-444-3425.

Please have the following information available *before* contacting our support personnel:

●   The plotter's model and serial number, which is printed on the plotter's identification tag,

●   The type of computer with which the plotter is being used,

●   The name and revision number of the computer's software package,

●   The cable configuration between the plotter and the computer,

●   A copy of the last menu settings (if the plotter has ever been operated),

●   A copy of the service test plot, which provides the plotter's ROM revision levels (see Appendix B). If the plotter will not run the service test plot, write down the error code displayed on the control panel LEDs (see Appendix A),

●   The date of purchase,

●   The type of maintenance agreement, if any,

●   The names of the reseller and contact and phone numbers,

●   A brief description of the problem.
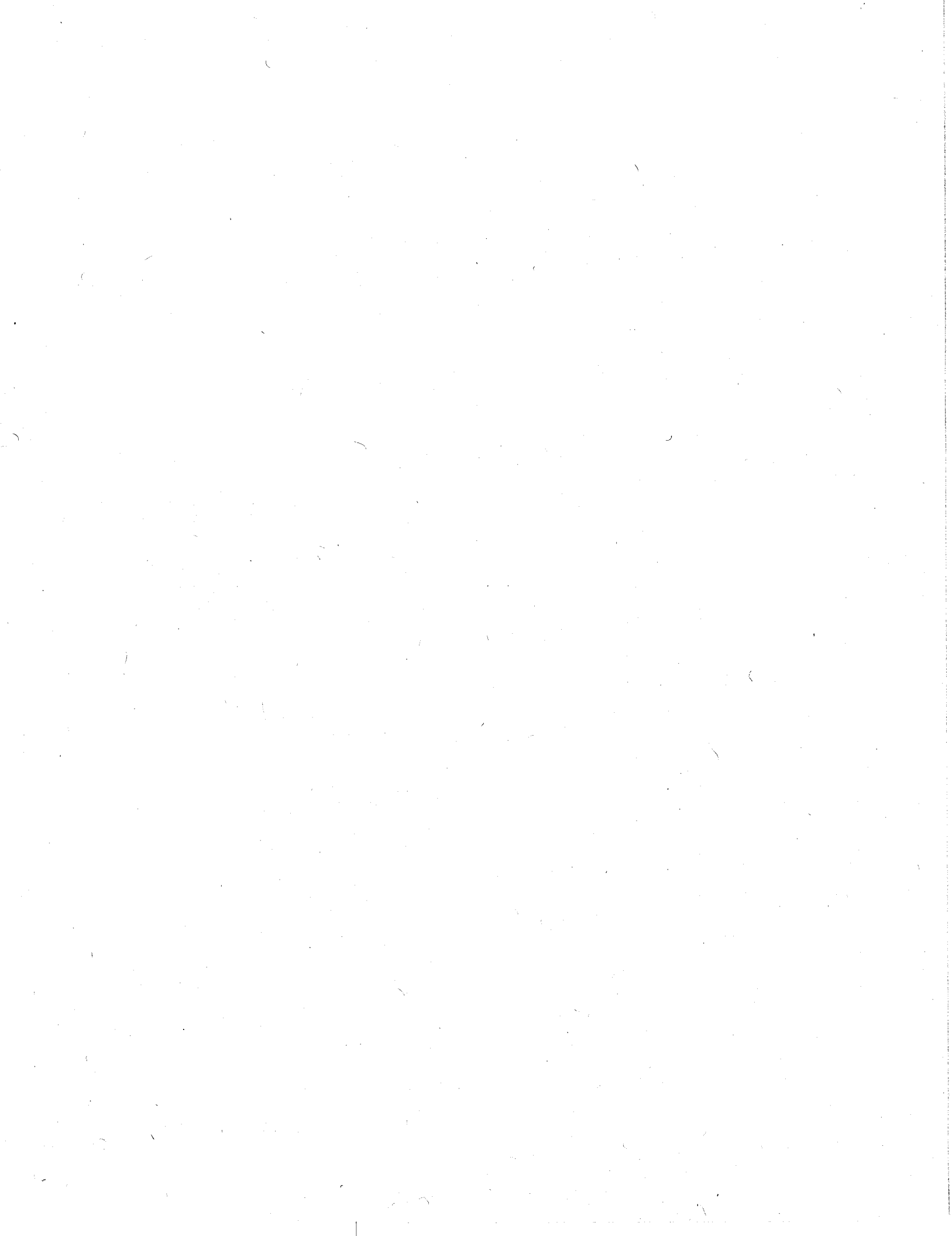
APPENDIX A
CONTROL PANEL LED OPERATING AND ERROR CONDITIONS

A.1   INTRODUCTION

The control panel LED indicators display various operating and error conditions. A summary of the displays are listed in Table A-1. The conditions are explained in the following paragraphs.

NOTE

This appendix uses three different graphic symbols to illustrate the status of an LED. The □ symbol means that the LED is off, and the ■ symbol means that the LED is on. If an LED is flashing on and off, the ✳ symbol is used.

TABLE A-1. LED INDICATOR CODE SUMMARY

LED INDICATOR				CONDITION AND REFERENCE PARAGRAPH
RESET	LOAD	LOCAL	ENTER	
Normal Operation				
□	■	□	□	Remote mode, A.2
✳	✳	□	□	Out of media, A.3.1
□	■	■	□	Local mode, A.2
□	■	□	■	Menu mode, A.2
□	■	■	■	Window mode, A.2
□	■	■	✳	Digitizer mode, A.2
✳	□	✳	□	Pen pause, A.2

□ = LED off   ■ = LED on   ✳ = LED flashing

TABLE A-1. LED INDICATOR CODE SUMMARY (Continued)

LED INDICATOR				CONDITION AND
RESET	LOAD	LOCAL	ENTER	REFERENCE PARAGRAPH
Error Conditions				
□	✳	□	✳	Window error, A.3.2
✳	□	□	✳	Pen changer status change, A.3.3
✳	□	✳	✳	Pen changer error, A.3.3.1
□	□	□	✳	EEPROM error, A.4.1
□	□	✳	□	ROM error, A.4.2
□	□	✳	✳	RAM error, A.4.3
□	✳	□	□	Communication error, A.5
✳	✳	✳	□	Voltage error, A.6.1
✳	✳	✳	✳	Current error, A.6.2
□	✳	✳	□	Extended buffer error, A.7
□	✳	✳	✳	RS-232-C loopback test error, A.8
✳	✳	□	✳	Program error, A.9
✳	□	□	□	Plot Command Condition, A.10

□ = LED off   ■ = LED on   ✳ = LED flashing

A.2 NORMAL OPERATION LED DISPLAYS

The following LED displays occur during normal operation.

Remote Mode

☐   ■   ☐   ☐

This code indicates that the plotter is ready to operate in remote mode (see Paragraph 2.2).

Local Mode

☐   ■   ■   ☐

The control panel keys can be used to manually operate the plotter when this code is displayed (see Paragraph 2.3).

Menu Mode

☐   ■   ☐   ■

This code indicates that the plotter is presently in menu mode (see Paragraph 2.4).

Window Mode

☐   ■   ■   ■

This code indicates that the plotter is in window mode (see Paragraph 2.8).

Digitizer Mode

☐   ■   ■   ✳

If this code is displayed, the plotter has received a DM/PL Digitize command or a HPGL Digitize Point command and is ready to transmit x-,y-coordinate data (see Paragraphs 1.10 and 4.4.10).

Pen Pause

✹ ☐ ✹ ☐

This code indicates that the plotter is being operated as a single-pen unit (or the multi-pen changer accessory is configured for single-pen operation) and is waiting for a manual pen change. To continue plotting, manually change pens and then press the LOCAL key. The pen pause feature can be disabled in the menu by selecting the *IGNORE* option in the menu *PEN PAUSE* parameter (see Paragraph 2.4).

A.3 NONFATAL OPERATING CONDITIONS

The flashing LED codes listed below occur if a nonfatal operating condition is detected by the plotter. (A nonfatal flashing LED code may, however, be caused by a fatal steady state LED code as described in the following paragraphs.) A nonfatal operating condition requires operator attention to continue normal plotting activities. If a nonfatal condition occurs, correct the problem and then press the LOCAL key to continue plotting.

A.3.1 Nonfatal Chart Media Operating Conditions

The following codes are displayed if the plotter detects a nonfatal chart media operating condition.

✹ ✹ ☐ ☐

In most instances, this code simply indicates that media is not presently installed in the plotter. If media is not installed, load the plotter with a chart and then press the LOCAL key. The plotter will automatically execute a load and will then continue.

If the new chart size is changed by more than 0.25 inch (6.35 mm) when plotting media is installed, the plotter will execute a reset rather than a load. This is because the present windowing is no longer valid for the new size.

This error code has an LED steady state feature. The exact cause of the error condition can be checked by pressing the ENTER key. After the ENTER key is pressed, the plotter will exit the present flashing error code and will display a steady (non-flashing) error description code. The particular LED that remains on identifies the condition error that the plotter has detected. To return to the original flashing error code, press the ENTER key again. To resume plotting after changing charts, press the LOCAL key. The steady state LED codes are explained below.

Media Not Detected

☐　　　☐　　　☐　　　■

The above code indicates that the plotter does not detect plotting media. If media is installed, the plotter may have a hardware problem in its chart sensors and service is required (see Paragraph 5.3).

Illegal X-axis Chart Length

☐　　　☐　　　■　　　☐

The above code indicates that the plotter does detect plotting media, but did not detect a rear chart edge within the limits of the plotter's maximum X limit. The chart presently loaded therefore has an illegal x-axis length. A hardware problem with the plotter's chart sensors can also cause the above error code. If the chart presently loaded is legal size, then service is required.

Paper Drive Hardware Failure

☐　　　■　　　☐　　　☐

This error occurs if there is a hardware problem in the paper drive mechanism or electronics. Service is required (see Paragraph 5.3).

Optical Paper Sensor Failure

■　　　□　　　□　　　□

This error occurs if the optical paper sensor fails. Service is required (see Paragraph 5.3).

A.3.2　Window Error Code

The following code is displayed if an error is detected while operating the plotter in window mode.

Illegal Clip Limits

□　　　✳　　　□　　　✳

This illegal clip limit condition occurs if the clip limits are set to less than two dimensions. This is caused by specifying one point as both the lower left and the upper right corner points of a window. To recover, either press LOCAL and specify the clip limits again or power down/up the plotter. (The window limits default to maximum at power up.)

A.3.3   Multi-Pen Changer Accessory LED Condition Codes

The following LED codes may be displayed during operation if a problem occurs with the multi-pen changer accessory.

Change in Status of the Multi-Pen Changer

✸   ☐   ☐   ✸

When the plotter is reset, it checks whether the multi-pen changer accessory is connected or not and if its pen stable assembly is in the upper or lower position. This condition occurs if the status of the pen changer has changed since the last reset.

To correct the condition, either configure the pen changer unit as it was at the last reset and then press LOCAL, or configure the pen changer to the way you want it and then press RESET or LOAD.

A.3.3.1 Multi-Pen Changer Pen Error Codes

This error condition can occur only if the multi-pen changer accessory is installed and the plotter is being operated in multi-pen mode.

The LED error code listed below indicates that the multi-pen changer unit has some type of malfunction.

✸   ☐   ✸   ✸

This error code has a LED steady state display. If the ENTER key is pressed one time, the plotter will display the type of error that has occurred. The four possible error types and recovery instructions are explained below. (This error code does have a second LED steady state level which displays whether the stable was moving in or out at the time of the error. If the ENTER key is pressed a second time, the code 0001 indicates that the stable was moving in, and the code 0010 indicates it was moving out. This information is useful only to service personnel.)

Overcurrent Detected During Stable Move-in

☐   ☐   ☐   ■

This code indicates that the plotter detected overcurrent as the pen stable assembly was moving in toward the pen holder.

If there is a foreign object that is preventing the pen stable assembly from traveling the required length to the pen holder, then remove the object. A pen that is accidentally placed in the plotter's pen holder will also cause this error condition. After correcting the situation, refer to the recovery instructions, which follow the error type codes, to continue plotting.

If it appears that the pen stable assembly is not aligned with the pen holder, the plotter should be powered down and the problem fixed. Align the stable assembly again as described in the pen changer operation manual. Be sure that the pen changer unit is correctly installed as described in its operation manual.

Optical Sensor Error During Move-in

☐   ☐   ■   ☐

This error code indicates that the optical sensor inside of the pen changer unit has failed to report a pen stable move-in to the plotter.

Check the continuity of all of the wires in the cable that connects the pen changer unit and the plotter and be sure the pen changer's arm assembly is in the down position. (The optical sensors can be tested as explained in Appendix B.) After correcting the situation, refer to the recovery instructions, which follow the error type codes, to continue plotting. If the error condition continues to occur on pen changes after checking the cable and making sure the arm assembly is in the down position, then service is required (see Paragraph 5.3).

Overcurrent Detected During Stable Move-out

□　　■　　□　　□

This code indicates that the plotter detected overcurrent as the pen stable assembly was moving away from the pen holder.

If there is a foreign object that is preventing the pen stable assembly from returning to its home/rest position, then remove the object. After correcting the situation, refer to the recovery instructions, which follow the error type codes, to continue plotting.

Optical Sensor Error During Move-out

■　　□　　□　　□

This error code indicates that the optical sensor inside of the pen changer unit has failed to report a pen stable move-out to the plotter.

Check the continuity of all of the wires in the cable that connects the pen changer unit and the plotter and be sure the pen changer's arm assembly is in the down position. (The optical sensors can be tested as explained in Appendix B.) After correcting the situation, refer to the recovery instructions, which follow the error type codes, to continue plotting. If this error condition continues to occur on pen changes after checking the cable and making sure the arm assembly is in the down position, then service is required (see Paragraph 5.3).

Multi-Pen Changer Pen Error Recovery Instructions

If you found that the plotter or the pen changer unit requires service to recover from a pen error, power down the plotter and refer to Paragraph 5.3. If you have identified the cause of the error condition and fixed the problem, then follow the instructions below.

After any type of pen error, the plotter will not retry an aborted pen operation. You must manually perform the pen operation yourself. After using the LEDs to identify the type of error that has occurred, note the present location of the plotter pen and then refer to Table A-2 to determine what action is required.

TABLE A-2. PEN RECOVERY INSTRUCTIONS

CONDITION	OVERCURRENT OR OPTICAL FAILURE ERROR DURING MOVE-IN	OVERCURRENT OR OPTICAL FAILURE ERROR DURING MOVE-OUT
No pen in pen holder— No pen in stall	Place a pen in the pen holder and then press LOCAL	Place a pen in the empty pen stall for future use, and then press LOCAL
No pen in pen holder— Pen in stall	Remove the pen from the pen stall and place it in the pan holder, and then press LOCAL	Press LOCAL
Pen in pen holder— No pen in stall	Press LOCAL	Remove the pen from the pen holder and place it in the pen stall, and then press LOCAL
Pen in pen holder— Pen in stall	Remove the pen from the pen stall, and then press LOCAL	Remove the pen from the pen holder, and then press LOCAL

A.4   FATAL LED ERROR CODES

The following LED codes·are displayed if the plotter detects a fatal error or an error condition in which the plotter cannot be properly operated. Service is required to correct the conditions listed below (see Paragraph 5.3).

A.4.1   EEPROM Errors

☐   ☐   ☐   ✴

The EEPROM is the plotter's Electrically Erasable Programmable Read Only Memory chip. This chip contains the menu-selectable parameters and certain factory-set plotter control parameters.

The above code indicates that an EEPROM error has occurred. The plotter will not operate in this condition. If this error condition occurs after the next power up, then set the power switch to OFF and refer to Paragraph 5.3.

A.4.2   Fatal ROM Error

☐   ☐   ✴   ☐

This code indicates that a ROM (Read Only Memory) error has occurred and the ROM data is corrupted. The plotter will not operate in this condition. If this error condition occurs after the next power up, then set the power switch to OFF and refer to Paragraph 5.3.

A.4.3 Fatal RAM Error

☐   ☐   ✳   ✳

This code indicates that a RAM (Random Access Memory) error has occurred and there is at least one dead cell in the system RAM. The plotter will not operate in this condition. If this error condition occurs after the next power up, then set the power switch to OFF and refer to Paragraph 5.3.

A.5   COMMUNICATION ERROR CODES

The following codes are displayed if communication errors occur between the plotter and the computer. These errors are not fatal; however, the plotter cannot properly respond to computer control if communication errors occur.

Communication error checking by the plotter is useful when you are first setting up a plotter/computer interface. Communication errors most often occur when the plotter and a computer are first connected to each other. These errors are rare after a good communication link is established between the two devices.

Communication error checking is enabled by selecting the *REPORTED* option for the DM/PL menu *COMM ERRORS* parameter. After establishing a good communication link between the computer and the plotter, it is recommended to disable the communication error checking in the DM/PL menu by selecting the *IGNORE* option for the DM/PL menu *COMM ERRORS* parameter. A computer program that uses auto-baud will trigger errors in the plotter as it attempts to match baud rates.

If communication error checking is enabled in the DM/PL menu and the following LED error code is displayed, then some type of communication error has occurred.

☐   ✳   ☐   ☐

This error code has an LED steady state feature. The exact cause of the error condition can be checked by pressing the ENTER key. After the ENTER key is pressed, the plotter will exit the present flashing error code and will display a steady state LED code. The particular LED that remains on identifies the error that the plotter has detected. To return to the original flashing error code, press the ENTER key again. The steady state LED codes are explained in the following paragraphs.

Note that if multiple errors are detected, more than one LED will remain on.

It is also possible that no communication errors are reported by the plotter but the plotter still fails to respond to the host computer. This type of problem usually results from improper wiring in the computer/plotter data cable. If you suspect this is the problem, refer to your computer and software documentation and be sure that the handshake lines used by your computer and software are properly connected. This type of problem can usually be fixed by "looping back" certain lines on the computer connector end of the cable so that the computer is essentially handshaking with itself on those lines not required by the plotter but used on the computer.

Buffer Overflow

☐   ☐   ☐   ■

This error occurs if a handshaking problem exists between the host computer and the plotter. The code indicates that the main data buffer in the plotter is near overflow and unprocessed buffer data will be destroyed. This is a result of the computer not acknowledging the plotter's signal to stop sending data.

If this error occurs, check the handshaking lines in the software/computer/plotter interface cable and make sure they are connected to the correct connector pins. Be sure to check the software documentation to see if it requires a specific cable configuration.

Some software use only hardware handshaking. If this applies to your software, be sure the plotter *handshake RTS/DTR* menu parameter has the *TOGGLE* option selected.

If DM/PL Mode Two communication protocol (software handshake) is being used, be sure the computer is sending 256 bytes of data (or less) between requests for room in the buffer. Also, if you wrote the plot code program, be sure you did not select illegal characters for the prompt enable or prompt request characters. DM/PL Mode One and Mode Two and the prompt enable and prompt request commands are discussed in the *DM/PL Command Language Manual* (part number MI-1044), which is available as an option from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll-free: 1-800-444-3425.

Since this error code indicates that data corruption has most likely occurred, it is best to reset the plotter (or power down/up) before continuing.

General interface configurations are provided in Paragraph 1.9. Interface configurations for specific computer models are listed in Appendix E. Before building or ordering a cable, be sure to check your software documentation for possible cabling specifications.

Framing Error

☐   ☐   ■   ☐

This error code indicates that a transmitted character was not framed by a stop bit. This is usually caused by the computer and the plotter having different baud rates selected. Match the baud rates by either reprogramming the baud rate in the computer or by changing the baud rate in the plotter menu mode.

Parity Error

☐   ■   ☐   ☐

This error indicates that the transmitted parity and the received parity are mismatched. Check to be sure that the computer and the plotter are using the same type parity.

Overrun Error

■   □   □   □

An overrun error indicates that a byte of data was not read by the plotter before another byte of data was transmitted by the computer. This type of error condition is usually caused by a hardware failure and service may be required (see Paragraph 5.3).

A.6   VOLTAGE/CURRENT ERROR CODES

The following error codes protect the plotter from damage which may result from low voltage or high current.

A.6.1   Line Voltage Too High or Low

✻   ✻   ✻   □

Your plotter is designed to operate within the voltage ranges listed in Table 1-1. If the line voltage falls below or exceeds a voltage range, the above error code is displayed.

To recover, power down the plotter and have a certified electrician inspect the ac power source from which your plotter operates.

A.6.2   High Current Detected

✻   ✻   ✻   ✻

This error code is displayed if the plotter detects high current in its electronic circuitry. To prevent damage to its electronic components, the plotter will shut down and control panel operation is inhibited. It is possible, however, to use the control panel LEDs to determine the circuitry in which the high current occurred.

A typical cause of a high current error code is a bind in either the pen or chart drive mechanisms. To recover from the error code, power down the plotter and correct the condition which caused the binding problem. Install a new chart and power up the plotter.

If this error occurs without apparent reason, the plotter may have an electrical or mechanical problem and requires service (see Paragraph 5.3).

This error code has an LED steady state display. If the ENTER key is pressed one time, the plotter will display the circuitry in which the high current occurred.

X-Axis Average Position Error Too High

☐   ☐   ☐   ■

Y-Axis Average Position Error Too High

☐   . ☐   ■   ☐

High Current Detected in Multi-Pen Changer

☐   ■   ☐   ☐

X-Axis Instantaneous Position Error Too High

■   ☐   ☐   ■

Y-Axis Instantaneous Position Error Too High

■   ☐   ■   ☐

A.7   EXTENDED BUFFER REPORT CONDITION

□   ✱   ✱   □

This error code can occur only if the plotter has the extended buffer board accessory installed and if an error occurs during the automatic extended buffer board RAM test during power up.

If this error condition occurs after the next power up, set the power switch to OFF and refer to Paragraph 5.3.

A.8   RS-232-C LOOPBACK TEST CONDITION

□   ✱   ✱   ✱

This code indicates that the plotter has been placed in the RS-232-C loopback test routine. This feature is explained in Appendix B.

A.9   PLOT CODE PROGRAM ERROR

✱   ✱   □   ✱

This error code occurs if the plot code in a program contains a bug that confuses the plotter's processor. Review the plot code for errors.

A.10 PLOT COMMAND CONDITION CODES

✳   ☐   ☐   ☐

This code indicates that the plotter has recognized an illegal code sequence or set of command parameters, or has received a command which places the plotter in a state for operator attention.

This code has an LED steady state display. If the ENTER key is pressed one time, the plotter will display the type of error or condition that has occurred.

Illegal Command Code

☐   ☐   ☐   ■

This code indicates that the plotter has received a DM/PL Closed Figure (CF) command with parameters that exceed a 2500 byte limit. The limit is due to the plotter's internal memory, and use of the extended buffer board will not increase the number of allowed vectors, arcs, and embedded commands in the CF command.

If this error occurs, you can divide the CF command figure into smaller figures that contain fewer parameters. To compute the maximum number of vectors or arcs allowed in a CF command, add the required bytes for each data type and compare the sum to the maximum limit of 2500 bytes. Each vector is eight bytes, an embedded CP parameter is two bytes, and an embedded CM parameter is 22 bytes.

To recover from this error code, you can press the LOCAL key which causes the plotter to either ignore the command or process as much of it as possible, or you can abort the plot by pressing either the RESET key or the LOAD key.

End of Plot Command Received

☐   ☐   ■   ☐

The above code indicates that the plotter has received a DM/PL end of plot (e) command. To resume plotting after changing plotting media, first press the ENTER key to return to the original flashing code, and then press the LOCAL key. The plotter will then track the media and immediately begin plotting the next buffer file.

Reserved

☐   ■   ☐   ☐
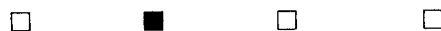
and

■   ☐   ☐   ☐

These codes are reserved. If for some reason one should appear, press the LOCAL key to continue plotting.

APPENDIX B
MANUFACTURING SETUP MODE (MSM)

B.1 INTRODUCTION

Manufacturing setup mode (MSM) provides you with eight different test and demonstration routines which can be initiated from the control panel. Normal operation of the plotter, such as remote mode, menu mode, and temporary velocity settings, is inhibited while the plotter is operating in MSM.

MSM has two levels of operation—level one and level two. MSM level one (MSM L1) enables you to select one of the eight MSM routines that you want to run. MSM level two (MSM L2) is the actual execution of the selected MSM L1 routine.

Instructions on how to operate the plotter in MSM L1 and MSM L2 are explained in the following paragraphs. A summary of the instructions is listed below.

1.   Set the power switch to OFF and install a chart and a pen into the plotter.

2.   To initiate MSM L1, press and hold the RESET and the LOAD keys while powering up the plotter. Release the keys after the plotter beeps one time.

3.   Use the ◄ and the ► keys to select an MSM L1 routine.

4.   After selecting a routine, press the ENTER key to initiate MSM L2 to execute the routine.

5.   After the routine completes, press the RESET key to return to MSM L1.

6.   Press the RESET key once more to return to remote mode for normal operation.

NOTE
This section uses two different graphic symbols to illustrate the status
of an LED. The □ symbol means that the LED is off, and the ■
symbol means that the LED is on.

B.2   MSM L1 INITIATION

Before initiating MSM L1, install a chart of any size and a pen.

To initiate MSM L1, first set the power switch to OFF. With the power off, press and hold the RESET and the LOAD keys, and then power up the plotter *while holding* the two keys. After the plotter beeps one time, release the two keys.

The plotter will then find the X and Y limits of the chart as in normal operation; however, the pen will park at plot origin right (large chart) regardless of the chart size installed. After the chart limits are found and the pen parks at plot origin right, all four LED indicators will turn off.

CAUTION
Manufacturing setup mode inhibits the chart sensing of the plotter, therefore you must exercise care when operating your unit in this mode. The plotter sizes the chart that is installed at the initialization of MSM and it expects you to use that chart during MSM routines. If you install a different size chart without pressing either the RESET or the LOAD key, then a pen crash may occur. Lifting the pinch rollers and manually moving a chart with your hands may also cause a pen crash.

B.2.1   Local and Reset Key Functions in MSM L1 and L2

If the LOCAL key is pressed while the plotter is in MSM L1, the plotter enters MSM L1 local mode. MSM L1 local mode enables you to use the ▲, ►, ▼, and ◄ keys to move the pen to any location on the chart. Normal windowing operations can also be performed at the control panel as explained in Paragraph 2.8. To exit MSM L1 local mode and return to MSM L1, press the LOCAL key again.

If the pen is moved while the plotter is in MSM L1 local mode, it will retain that location after MSM L1 local mode is exited. This enables you to execute different routines at different locations on the chart.

If the plotter is in MSM L1 local mode and the RESET key is pressed, the plotter will return to the initial MSM L1. This enables you to reset the plotter in MSM L1 local mode without having to initiate manufacturing setup mode using the power switch again. However, if the RESET key is pressed while the plotter is in the initial MSM L1, the plotter will return to normal remote mode operation.

B.3   MSM L1 ROUTINE SELECT PROCEDURE

The ◄ and ► keys are used to select MSM L1 routines. The present MSM L1 routine is displayed in binary code on the control panel LEDs. Use the ◄ key to increment the routine numbers and use the ► key to decrement the routine numbers. The binary LED code for each MSM L1 routine is listed in Paragraph B.4.

B.4   MSM L2 ROUTINE EXECUTION PROCEDURE

After the desired MSM L1 routine number is displayed on the control panel LEDs as described in Paragraph B.3, press the ENTER key. This causes the plotter to enter MSM L2 and execute the selected MSM L1 routine. It is important to note that once the plotter enters MSM L2 and is running a routine, the control panel LEDs may or may not display the present MSM L1 routine number. This is because the plotter uses the LEDs in some MSM L2 routines to display information to you. It is your responsibility to keep track of the MSM level in which you place the plotter. To exit MSM, press the RESET key.

The following paragraphs provide the binary MSM L1 code number and describe each corresponding MSM L2 routine.

B.4.1   Service Plot

☐   ☐   ☐   ☐

The service plot provides you with two lines of information about the plotter's configuration.

The first line of information provides the model identification and the revision numbers of the installed ROMs, the present baud rate menu selection, and the present addressing resolution.

The second line of information provides the DM/PL buffer size, whether or not the plotter has the optional extended buffer board or Kanji character set accessory installed, and the actual serial number of the plotter.

B.4.2   Europlot

☐   ☐   ☐   ■

This routine causes the plotter to draw the Europlot design that is described in Paragraph 2.3.2.

B.4.3   Font Demonstration

☐   ☐   ■   ☐

The font demonstration routine causes the plotter to draw a demo plot of the fonts that are stored in the plotter's ROM.

B.4.4   Multi-Pen Changer Setup Test

☐   ☐   ■   ■

This routine enables you to test the multi-pen changer accessory unit. Execute this routine only after installing the unit as described in its operation manual.

If the ENTER key is pressed, the pen holder will move in front of pen stall one, and then the plotter will beep. If the pen holder favors one side or the other of pen stall one, the rear support screws that secure the pen changer to the plotter can be loosened and the pen unit moved slightly left or right. (This is explained in the unit's operation manual.)

Testing of the optical sensors in the pen changer requires you to manually move the arm assembly forward and backward. To prevent permanent damage to the plotter's beam assembly, grasp the pen changer base unit with one hand and push or pull the arm assembly with the other hand.

To test the optical sensors in the pen changer, manually slide the arm assembly forward until you see the following LED display code on the control panel:

☐　　　☐　　　■　　　☐

This code indicates that the unit's rear sensor is uncovered and the front sensor is covered.

Manually push the arm assembly backward until it is centered between full out and full in. The control panel LEDs should display the following code:

☐　　　☐　　　■　　　■

This code indicates that both the front and rear sensors are uncovered.

Manually slide the the changer arm assembly backward until you see the following LED display code on the control panel:

☐　　　☐　　　☐　　　■

This code indicates that the front sensor is uncovered and the rear sensor is covered.

If you received the correct LED codes during this test, the optical sensors in the pen changer are operating correctly.

If all of the control panel LEDs turned off during any part of this test, then a hardware error occurred with the pen changer unit. The error condition may be caused by either a faulty cable or a cable that is incorrectly installed, or an optical sensor or control panel LED may be burned out. If the error cannot be corrected at the cable level, then service is required (see Paragraph 5.3).

B.4.5   Lift and Lower Pen Test

☐   ■   ☐   ☐

If this test is activated, the pen holder can be lowered by pressing the ▲ key and raised by pressing the ▼ key.

The auto-up time is inhibited during this routine, therefore the pen will remain in the down position until it is toggled to the up position.

The pen holder can be moved by placing the plotter in MSM L1 local mode and then using the manual movement keys.

To exit this routine, press the ENTER key.

B.4.6   Plotter Repeatability Test

☐   ■   ☐   ■

This routine's MSM L2 is divided into two subroutines. One MSM L2 subroutine tests the repeatability of a single pen and the other MSM L2 subroutine provides a pen-to-pen repeatability test for a multi-pen changer unit.

After you press the ENTER key to place the plotter in this routine's MSM L2, the control panel LEDs will turn off. This indicates that you are presently in the single pen repeatability test. You now have the option to execute the single pen test or to toggle to the multi-pen unit test.

To execute the single pen test, press the ENTER key again and the single pen test will begin. To toggle to the multi-pen test, press either the ◄ key or the ► key and the control panel LEDs will display a binary one (0001). The multi-pen test can then be executed by pressing the ENTER key.

If the single pen test is executed, the plotter will:

● draw a border line around the chart size that was detected by its sensors,

● over-plot the four corners of the internal limits,

● draw a cross in the lower right area of the chart,

● draw a cross in the upper left area of the chart,

● draw a series of down vectors one-fifth the length of the chart in the X direction and 0.1 inch in width in the Y direction,

● and then over-plot the two crosses already drawn.

If you want to run the pen-to-pen repeatability subroutine, be sure your plotter has the multi-pen accessory unit installed and is loaded with six pens. To execute this subroutine, press either the ◄ key or the ► key to toggle the binary one (0001) pen-to-pen subroutine on the LEDs, and then press the ENTER key.

The pen-to-pen routine causes the plotter to draw a cross in the center of the chart with each pen in the multi-pen changer unit.

B.4.7   RS-232-C Loop-Back Test

☐   ■   ■   ☐

This routine verifies that the plotter's handshaking lines are functioning properly.

Before running this routine, pin 2 must be jumpered to pin 3 on the plotter's RS-232-C connector, and pin 4 must be jumpered to pin 5. The routine causes the plotter to transmit and receive data to itself. It automatically repeats the transmission at each available baud rate. After each successful transmission at a given baud rate, the plotter emits a beep. The length of each transmission will vary because of the different baud rates.

The control panel LEDs do not illuminate during successful tests. If an error is detected, the plotter will display LED error codes, which are listed below. If all of the transmissions are successful, the plotter returns to MSM L1 and the LEDs display the loop-back test MSM L1 routine code.

The RS-232-C loop-back error codes are listed below. (If more than one type of error occurs, multiple errors codes will be displayed.)

☐   ☐   ☐   ■

This error code indicates that data is received, but does not match the data that was transmitted. This implies that the line drivers are functioning properly, but excessive noise is occurring on the RS-232-C line. Service is therefore required.

☐   ☐   ■   ☐

This indicates that data is not being received by the logic board microprocessor. This error occurs if pins 2 and 3 are not jumpered or if there is a general UART (Universal Asynchronous Receiver/Transmitter) failure. If this error code (0010) is displayed with the hardware handshake error code (0100), which will produce a (0110) code, and the correct pins are jumpered, then the UART and/or the line drivers require service.

☐   ■   ☐   ☐

This error occurs if the program cannot toggle the hardware handshake line (RTS/DTR). If pins 4 and 5 are properly jumpered, then the UART and/or the line drivers require service.

■   ☐   ☐   ☐

This code indicates that a parity, framing, or overrun error has occurred. These errors are usually caused by a UART failure.

B.4.8 Restore Factory-Selected Menu Parameters

□   ■   ■   ■

This routine restores the menu parameters to the factory-selected values. These values are as follows:

PARAMETER	DM/PL	HPGL
DMP-61 up velocity	32 ips	800 mm/s
DMP-61 up acceleration	4 g	4 g
DMP-61 down velocity	24 ips	600 mm/s
DMP-61 down acceleration	4 g	4 g
DMP-61 down delay	50 msec	50 msec
DMP-62 up velocity	24 ips	600 mm/s
DMP-62 up acceleration	4 g	4 g
DMP-62 down velocity	24 ips	600 mm/s
DMP-62 down acceleration	4 g	4 g
DMP-62 down delay	70 msec	70 msec
Up delay	30 msec	30 msec
Pen change	ignore	ignore
Plot origin	auto	right
Constant velocity	on	on
Addressing	0.001 inch	—
Menu units	English	—
Text font	F0	—
Character set	G0	—
Auto-pen capping	120 sec	120 sec
Baud rate	9600 baud	9600 baud
UART parity	bit 8 = 0	bit 8 = 0
Handshake RTS/DTR	toggle	toggle
Pass-through port	toggle	—
Line status	—	standalone
Outlined fonts	filled	—
Number of pens	6	6
Zero character	plain	plain
Comm errors	ignored	—
Option board	on	on

APPENDIX C
OPTION BOARDS

C.1   Introduction

This appendix explains how to install either the extended buffer board option or the Kanji character set board option. Both option boards use the same logic board connector; therefore, the plotter can be operated with only one option board installed at a time. Refer to Paragraph 1.11 for general information about the extended buffer board.

C.2   Option Board Installation Instructions

NOTE
Houston Instrument's limited warranty does not cover repair of option boards damaged by customer abuse, accident, misuse, or incorrect installation. A Houston Instrument dealer or qualified technician should install your option board.

1.   Be sure the plotter's power switch is set to OFF. Unplug the plotter's ac cord from the ac wall outlet and from the plotter's ac receptacle.

2.   Remove the pen changer or scanner accessories from the plotter, if installed. Remove any pen from the pen holder and any chart from the plotter. Disconnect the data cable from the plotter. Remove the plotter from its stand.

3.   Lower both pinch roller arms. Place the plotter upside-down on a soft cloth on a flat surface.

4.   Remove the screws shown in Figure C-1 and remove the bottom cover.

5. Place the option board over the plotter logic board with the component side up, but do not attempt to install it at this time. Turn the option board so that its connector J1 is on the same end of the logic board as the logic board connector P8 (the row of large pins). Note that there are six holes in the buffer option board and four holes in the Kanji option board with corresponding holes in the logic board. These holes are for the snap-in plastic standoffs. See Figure C-2.

6. Remove the option board and insert the snap-in standoffs into the corresponding holes in the front side (the component side) of the logic board. Six standoffs are required for the buffer board; four standoffs are required for the Kanji board.

7. Again place the option board over the plotter logic board with the component side up. Align connector J1 on the left side of the option board with connector P8 on the left side of the logic board (the row of large pins). Maintaining connector alignment, **CAREFULLY** and **SLOWLY** press the option board downward until you see the pins push through the option board connector. Then press downward on the edges of the option board to snap the standoffs into the option board.

8. Place the bottom cover on the plotter. Install the bottom cover screws and washers, but do not tighten them at this time. Locate the bottom cover opening for the DB-25 data connector. Slide the bottom cover to the left as far as possible so that the DB-25 connector is fully exposed and centered in the opening. Maintaining this position, tighten the bottom cover screws.

9. Mount the plotter on its stand. Attach the ac cord to the plotter ac receptacle and the ac wall outlet. Connect the data cable to the plotter. If previously removed, install the pen changer and/or scanner accessories on the plotter.

The function of either option board can be toggled on and off by using the DM/PL or HPGL *OPTION BOARD* menu parameter (see Paragraphs 2.5 and 2.6).
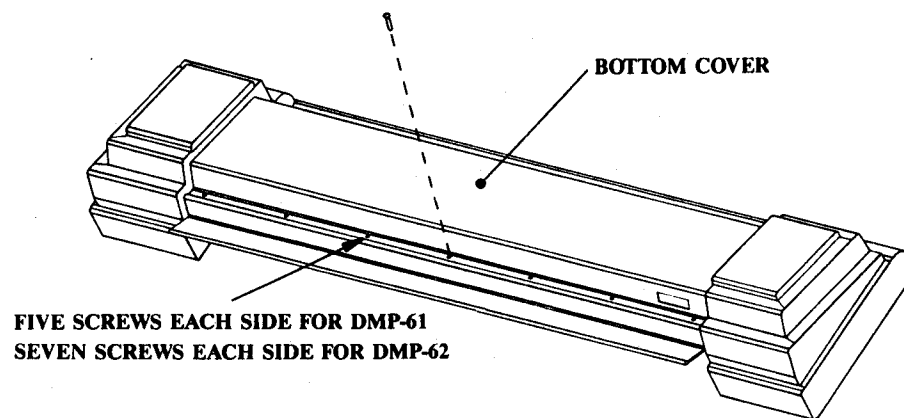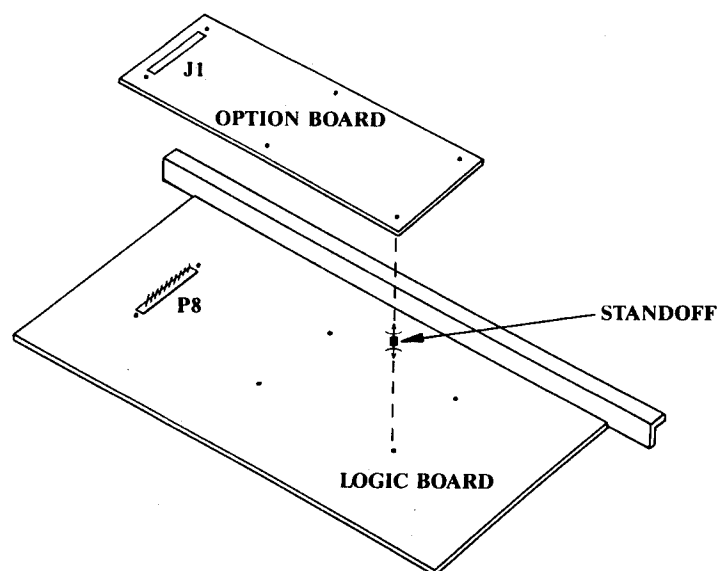
FIGURE C-1. BOTTOM VIEW OF PLOTTER

FIGURE C-2. OPTION BOARD

APPENDIX D
OPERATING CONDITIONS FOR PLOTTING MEDIA

Although the plotter's approved environmental operating range is 40° to 95° F (4.5° to 35° C) at 20% to 95% relative humidity, extreme high or low temperature and humidity conditions may cause the plotting media to expand or contract.

Figure D-1 shows the recommended operating range for all sizes of film and for vellum and paper chart sizes Engineering A, Engineering B, Architectural A, Architectural B, A4 DIN, A3 DIN, Oversize A4, and Oversize A3.

Figure D-2 shows the recommended operating range for vellum and paper chart sizes Engineering C, Engineering D, Engineering E, Architectural C, Architectural D, Architectural E, A2 DIN, A1 DIN, A0 DIN, B1 DIN, Architectural /Engineering F, Architectural 30 × 42 inches, Oversize A2, Oversize A1, and Oversize A0.

If the plotting media is being used in an extreme operating condition, you may have to load the larger size charts differently than explained in Paragraph 1.7. The following paragraph explains how.

Under normal operating conditions, a chart should be aligned with the white line on the right end of the platen and the groove on the platen extension as explained in Paragraph 1.7. However, if the chart has contracted, you must center the chart between both pinch rollers so that the pinch roller wheels make contact with the edges of the chart. If the chart has expanded, you must move the chart to the right so that it does not make contact with the left pinch roller assembly during paper shuffle.
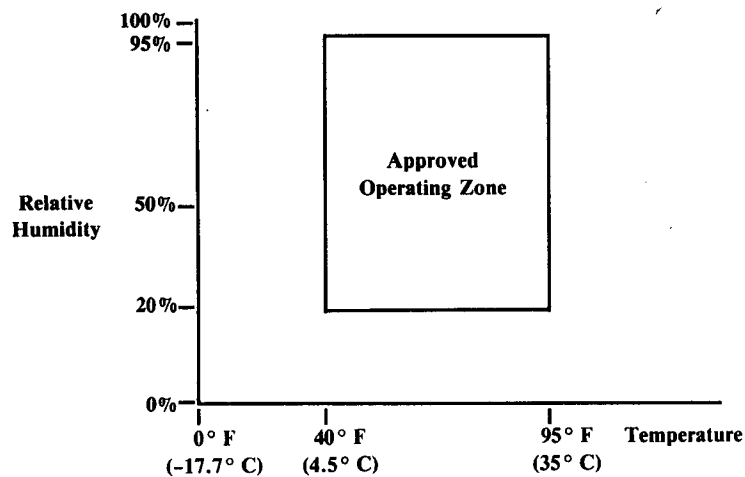
FIGURE D-1.
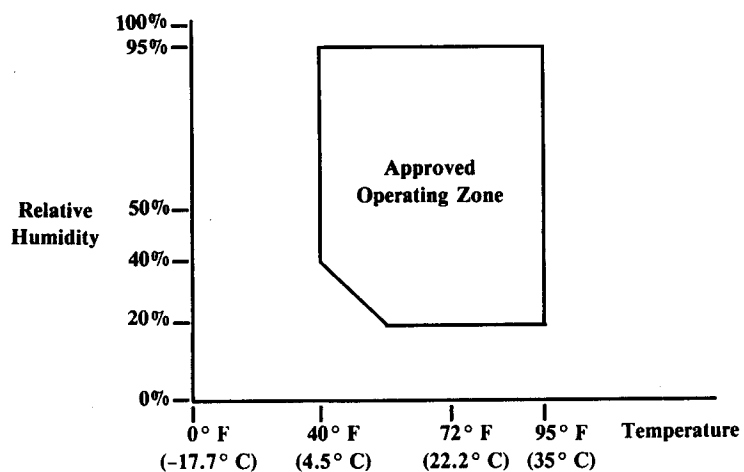**OPERATING RANGE FOR ALL FILM AND SMALL CHART PAPER**

FIGURE D-2.
OPERATING RANGE FOR LARGE CHART PAPER AND VELLUM

APPENDIX E
INTERFACE NOTES FOR DMP-60 SERIES PLOTTERS

The following paragraphs describe communication between a computer and the plotter. These notes are arranged by computer configuration, and contain the following information, where pertinent.

- Cable Specifications. A cable specification is given for the plotter. The exact pin-for-pin description is detailed, as well as the type of connector needed on each cable end. These cable definitions establish a communications link between the computer and plotter and provide hardware handshake capability. Refer to Paragraph 1.9 for further information about the serial RS-232-C interface.

NOTE
The cable specifications described are general purpose and work with most software packages. Before using these cable specifications, however, you should consult your software documentation. If the software package requires a unique cable specification, it will be listed in the software documentation.

- System Setup. Instructions may be given to set up the computer's serial port. This setup is necessary to run the plotter with the computer. Information about setting up baud rate, parity, handshake mode, and pass-through port parameters for the plotter are given in Paragraph 2.4.

- Communication And Handshaking. A BASIC program may be given that draws 1500 circles horizontally across the chart. The purpose of this program is to demonstrate the communications and handshaking abilities of the plotter and computer.

E.1 **Apple Macintosh 512K Enhanced With A 9-Pin Serial Port**

● Cable Specifications:

Plotter	Computer
DB-25S Connector	DB-9P Connector

```
2 TD  _____  9
3 RD  _____  5
4 RTS _____  7
7 GND _____  3
```

(1, 5, 6, and 8-25 are   (1, 2, 4, 6, and 8
not connected.)   are not connected.)

E.2 **Apple Macintosh Plus, Macintosh SE, Or Macintosh II With An 8-Pin Serial Port**

● Cable Specifications:

Plotter	Computer
DB-25S Connector	8-Pin (Male) DIN Connector

```
2 TD  _____  5
3 RD  _____  3
4 RTS _____  2
7 GND _____  4
```

(1, 5, 6, and 8-25 are   (1, 6, 7, and 8
not connected.)   are not connected.)

E.3   **IBM AT Or Compatible Computer With A 9-Pin Serial Port**

●   Cable Specifications:

Plotter   Computer

DB-25S Connector   DB-9S Connector

```
2 TD _____ 2
3 RD _____ 3
4 RTS _____ 8
7 GND _____ 5
```

(1, 5, 6, and 8-25 are   (1, 4, 6, and 9
not connected.)   are jumpered together.)
                                     (7 is not connected.)

Houston Instrument cable number HR29-483 corresponds to this cable definition.

●   System Setup:

NOTE
The following setup information assumes that you are using PC-DOS.

1.   Boot up the operating system.

2.   After the system prompt, issue the following command to configure the serial port:

MODE COM1:9600,N,8,2,P

3.   After the system prompt, issue the following command to redirect output to the serial port:

MODE LPT1:=COM1:

4.   The computer end of the cable must be connected to the serial port defined as COM1. The plotter menu must be set for baud rate of 9600, parity of NONE, BIT 8=0, and RTS/DTR mode of TOGGLE.

●   Communications And Handshaking:

NOTE
The following BASIC program assumes that you are using IBM's BASICA or Microsoft's GWBASIC.

1.   After the system prompt, issue the command to load BASIC. For more information about loading BASIC, consult your computer documentation.

2.   After loading BASIC, type in the following program:

PROGRAM	COMMENTS
10 LPRINT ";: A H O V2 P1 200,200"	selects the plotter
20 FOR X=300 TO 15300 STEP 10	defines x coordinate of center
30 LPRINT "CC ";X;",300 100 "	outputs series of 1500 circles
40 NEXT	
50 END	

3.   To save the program, issue the following command:

SAVE "PLOTEST.BAS"

4.   You may now run the program. Issue the following command:

RUN

5.   To load and run the program at a later date, issue the following command:

RUN "PLOTEST.BAS"

E.4   IBM PC, IBM PC/XT, IBM PS/2, Or Compatible Computer With A 25-Pin Serial Port

● Cable Specifications:

Plotter	Computer
DB-25S Connector	DB-25S Connector

```
2  TD _____ 3
3  RD _____ 2
4  RTS _____ 5
7  GND _____ 7
```

(1, 5, 6 and 8 through 25   (6, 8, 20, and 22
are not connected.)   are jumpered together.)
                                                      (1, 4, 9-19, 21, and 23
                                                      are not connected.)

Houston Instrument cable number HR29-316 corresponds to this cable definition.

● System Setup:

NOTE
The following setup information assumes that you are using PC-DOS.

1.   Boot up the operating system.

2.   After the system prompt, issue the following command to configure the serial port:

MODE COM1:9600,N,8,2,P

3.   After the system prompt, issue the following command to redirect output to the serial port:

MODE LPT1:=COM1:

4.   The computer end of the cable must be connected to the serial port defined as COM1. The plotter menu must be set for baud rate of 9600, parity of NONE, BIT 8=0, and RTS/DTR mode of TOGGLE.

●   Communications And Handshaking:

NOTE

The following BASIC program assumes that you are using IBM's BASICA or Microsoft's GWBASIC.

1.   After the system prompt, issue the command to load BASIC. For more information about loading BASIC, consult your computer documentation.

2.   After loading BASIC, type in the following program:

PROGRAM	COMMENTS
10 LPRINT ";: A H O V2 P1 200,200"	selects the plotter
20 FOR X=300 TO 15300 STEP 10	defines x coordinate of center
30 LPRINT "CC ";X;",300 100 "	outputs series of 1500 circles
40 NEXT	
50 END	

3.   To save the program, issue the following command:

SAVE "PLOTEST.BAS"

4.   You may now run the program. Issue the following command:

RUN

5.   To load and run the program at a later date, issue the following command:

RUN "PLOTEST.BAS"